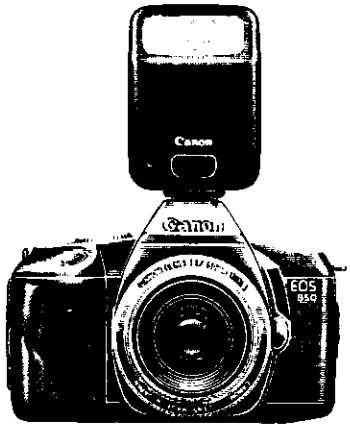
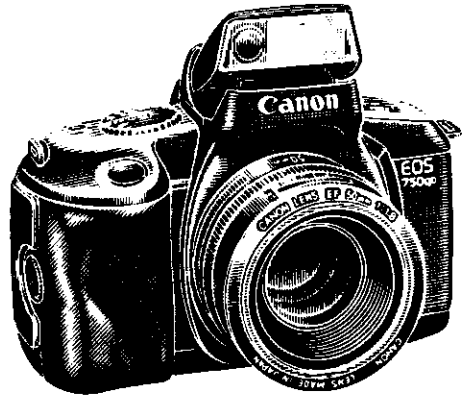
Canon

Service Manual

ENGLISH EDITION

EOS 850
750
750 QD
SPEEDLITE 160E





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EOS 850, EOS 750, & EOS 750QD

SPECIAL FEATURES

The EOS 850 incorporates the Intelligent Program AE and Depth-of-Field AE modes of the EOS 650 into a "better than basic" fully automatic SLR camera.

The EOS 750 takes the EOS 850 a step further by incorporating an integral automatic electronic flash.

By adding a permanently attached quartz calendar data back, it becomes the EOS 750 QD to round out the line.

Features:

A E	Intelligent Program AE
	Depth-of-Field AE
	Evaluative Metering
A F	Uses the excellent EOS 650/620 AF system.
Film Transport	Pre-wind Film System* protects exposed frames from accidental fogging.
Integral Flash:	Retractable integral automatic flash with two-second charging.

*: Motorized Pre-wind System
Film is wound completely to the end of the roll during loading, and winds back into the cartridge with each frame exposed. If the back cover is accidentally opened, only the unexposed film on the take-up spool is fogged. All, except the last frame exposed, are protected inside the film cartridge.

DESIGN SPECIFICATIONS

Most specifications for the EOS 750 and 850 are exactly the same, so both models will be listed together. When they differ, it will be indicated. Specifications related to the quartz date back of the EOS 750QD are listed separately. Other than these data related specs. the EOS 750 and EOS 750QD are identical. (There is no EOS 850QD.)

1. General

1-1 Type: Full-frame 35mm AE/AF single-lens-reflex camera with power winder and focal plane shutter (vertical travel)

1-2 Lenses used: Canon EF lens series (uses maximum aperture metering; stopped-down metering is not possible) (Canon FD, FL, and R lens series are not usable.)

1-3 Lens mount: Canon EF Mount (bayonet mount)

2. Autofocus (AF)

2-1 Type: TTL-SIR (TTL Secondary Image Registration)

2-2 Focusing: One-shot AF: In this mode, the autofocus determines the correct distance, focuses the lens to that distance and stops. The shutter will not release until focusing is complete.

2-3 AF operation: AF operation starts when the shutter button is pressed halfway.

2-4 AF operating speed: 0.3 sec. (from infinity to one meter with the standard EF 50mm f/1.8 lens)

2-5 AF focus indicator: Green LED in viewfinder and an electronic beeper, which cannot be turned off. Rapid (8Hz) blinking of LED indicates autofocus is not possible.

2-6 AF Working Range: EV 1 to EV 18 (ISO 100)

2-7 AF auxiliary light: <<750>> Built-in AF illuminator projects an infrared (peak at 695nm) patterned beam if necessary when the shutter button is pressed halfway. The light source is an ultra-bright LED with random vertical stripe pattern. It does not work if flash is turned off after popping up.

3. Viewfinder

3-1 Type: Eye-level SLR using pentaprism. (Fixed pentaprism without condenser lens.)

3-2 Focusing screens: Type C screen with AF mark

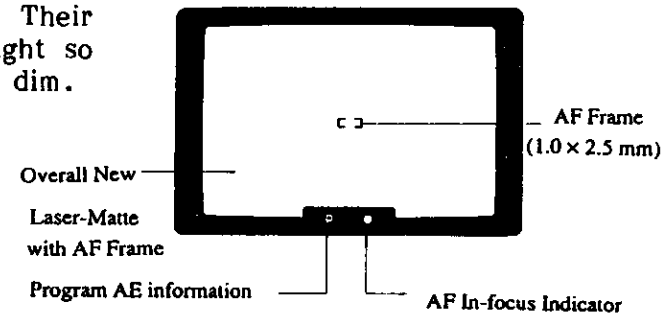
3-3 Viewfinder power: -1 dpt (with eye point at 16.0 mm)

3-4 Field of view: 92%, both vertically and horizontally

3-5 Magnification: 0.8X (with 50 mm lens at infinity)

3-6 Viewfinder information:

A "P" shaped and a round LED are located in the lower center portion of the viewfinder. The "P" is on the left and the "O" is on the right. Their brightness varies with ambient light so they are never too bright or too dim.



1. AF Indicator (green "O")
   In-focus: Steady light
   AF Impossible: 8Hz flashes
   Depth-of-field AE:
   Focus indication:
   Depth 1: Single blinks
   Depth 2: Double blinks
   (See Table 2 for details)
   SW1 on third time: Lights steadily if depth of field is OK, blinks at 4Hz if depth of field is too shallow.

2. AE Confirmation (green "P"):

Correct exposure & Flash Charged:	Steady light
Camera-shake warning:	Blinks at 2Hz
Out-of-range warning:	Blinks at 8Hz
Flash charging:	Off
Out-of-flash-range (300EZ and 420EZ)	Blinks at 8Hz

3-7 Mirror: Motor-driven mirror (mirror cannot be raised manually) Finder black-out time is 250ms or less at shutter speeds of 1/60 sec. or greater.

3-8 Viewfinder image cut-off: (due to mirror length) None up to EF300 + EF Ext. 2X, except for EF50mm f/1.0L

3-9 Depth of field confirmation: None

3-10 Eyepiece cover: Attached to the neck strap

3-11 Other: Angle finders, magnifier, eyesight correction lenses (type S and special EOS type with eye cup) can be attached to eyepiece. Special EOS type is provided as standard accessory.

4. Exposure control

4-1 Metering system: TTL maximum aperture evaluative metering using 6 section SPC

4-2 AE control system:

1. Intelligent program AE

2. Depth-of-field priority AE

3. Automatic TTL program flash AE
(built-in for 750; with Speedlite 160E for 850) fires automatically when needed for either low or back-lit situations.

4. A-TTL program flash AE (with 300EZ or 420EZ)

4-3 Meter coupling range: EV 0 to 19.5 with EF50 mm f/1.8 lens at ISO 100
(In hot, humid weather: EV +3 to 20)

4-4 Out of coupling range warning: "O" LED blinks at 8Hz

4-5 Exposure Reading: Displayed when shutter button pressed ½ way (SW1)

4-6 Film speed: ISO 25-3200, automatically set at full stops by DX code. No indication, manual setting not possible, sets to ISO 25 with non-DX film.

4-7 Exposure compensation: None

4-8 AE Lock: ^{N}o control: (AE is fixed when autofocusing is complete)

4-9 Multiple exposures: Not Possible

5. Shutter:

5-1 Type: Vertical travel electronically-controlled focal plane shutter
Attraction electromagnets for both first and second curtains.
[Curtain travel time: 6.2ms (24mm)]

5-2 Shutter speeds: 1/2000 to 2s; 1/8 step intervals; X sync: 1/125s
No manual speeds, No display

5-3 Shutter release: Electromagnetic release (no remote release)

5-4 Release time lag : From SW-2 ON to exposure after pausing briefly at
(excluding AF) SW-1 ON: < 100ms

5-5 Self timer: Electronically controlled 10 second delay starts when AF and AE operation are completed and shutter button is depressed (SW2 on). (Timer does not start until AF/AE are complete even if shutter button is pressed all the way.)
Operation is indicated by an LED, which flashes twice a second for the first eight seconds and then eight times a second for the remaining two seconds.

5-6 Camera shake warning: The warning works in either Program or D-O-F mode, but only when the flash switch is turned off (750), or when no flash is mounted (850).
The warning is the "P" LED flashing twice a second. It operates if the shutter speed falls below the reciprocal of the lens focal length by 0 to 0.5 EV.
With any other compatible flash mounted, the "P" blinks during charging and glows steadily when the flash is ready.

6. Film Transport

6-1 Type: Motorized Pre-wind System
Film is wound completely to the end of the roll during loading, and winds back into the cartridge with each frame exposed. "Rewinding" therefore consists only of winding the film leader into the cartridge. (Using this system, frame numbers on the film are reversed. Frame one is actually the last frame.

6-2 Loading: Automatic (spool & sprocket drive during loading) About 14 seconds are required to load a 24-exposure film. If the film fails to load properly, "S" shows on the counter, the release locks, and the beeper beeps rapidly for four seconds.

6-3 Film drive: Single miniature motor drives all functions.

6-4 Modes: Continuous in Program mode, single in D-O-F mode.

6-5 Activation: Exposure completion signal.

6-6 Speed: Approx. 1.2 frames/sec.

6-7 Verification: By frame counter

6-8 Leader Rewind: After final frame (#1), leader automatically rewinds into the cartridge.

6-9 Battery Life:

Table 1 (EF 50mm f/1.8 lens) 24 exposure rolls (exposures)

Temperature	EOS 750, QD			EOS 850
	Percentage of Flash Use			
	0%	30%	100%	
Normal (20°C)	75 (1800)	40 (950)	15 (350)	75 (1800)
Low (-10°C)	45 (1100)	25 (600)	10 (250)	45 (1100)

Conditions: Shutter released when focusing is completed. Battery is checked after each roll is completed. The interval between rolls is 20 seconds at normal temperatures and three minutes at low temperatures.

Note: Battery life is approximately ½ when USM lenses are used.

6-10 Film verification: Visual, through film window

6-11 Film counter: Subtractive mechanical, displays frames remaining

7. Integral Flash: <<750>>

7-1 Type: Automatic pop-up flash hidden in pentaprism hump. Parallel control flash termination.

7-2 Guide Number @ ISO 100, meters; 12

7-3 Recycling time: Less than 3 seconds

7-4 Coverage: Covers field of 35mm lens; beam is depressed 2.33° for parallax correction.

7-5 Activating conditions: Low light or back light

7-6 Aperture selection: TTL Program

7-7 Shutter Speed Control: Speed set to 1/60 - - 1/125 second

7-8 Flash duration control: Light measures off of the film plane

7-9 Syncro-Sunlight: Flash duration in back-lit situations is reduced slightly to preserve a natural balance between foreground and background.

7-10 Flash Coupling Range @ ISO100; 1.0 to 4.3 meters

7-11 Coupling Range Warning: None

7-12 Aperture Display: None

7-13 Ready Lamp: "P" serves as ready lamp

7-14 Synchronization: X sync (first curtain)

7-15 Power switch: The power switch is located on the top deck to the left of the central hump.

When set to the "Auto" position (which means on) the flash is activated when the exposure system deems it necessary.

The flash cannot be forced to fire when the metering system does not deem it necessary.

7-16 Operation:

First Frame: Lens focused ---> Light metering ---> Flash extended ---> Flash charging

Subsequent frames: Flash charging ---> Lens focused ---> Light metering ---> Flash extended

7-17 Extension: 70.5mm above optical axis

7-18 Power Source: Camera battery

7-19 Miscellaneous: The flash does not operate if another flash is installed in the hot shoe.

8. Body

8-1 Back cover: Fixed, hinged; opened by release lever (equipped with safety lock). with film verification window.

8-2 Flash contacts: EOS dedicated X sync hot shoe

8-3 Automatic Flash:

The function of the EOS 750 with its integral flash, and the EOS 850 with the Speedlite 160E, are basically the same. Differences are noted.

1. Autoflash: Autoflash is activated by either low or back lighting. In Canon nomenclature it operates in the "TTL" mode. Immediately after metering determines one of these conditions exist*, the flash starts charging. When charging is complete, the shutter speed is set within 1/60 - 1/125 second, and the aperture is programmed by the TTL program. When the shutter is released, light reflected from the film plane is metered to determine flash duration.

   *: Speedlite 160E starts charging when SW1 is turned on, regardless of lighting.

2. Dedicated Flashes: Speedlites 300EZ and 420EZ operate in the A-TTL mode when mounted on the 750 or 850. Other modes of the speedlites are inoperative. A-TTL modes operates as it does with first generation EOS cameras.

3. ML-2, ML-3,TTL Mode: Upon completion of charge, shutter speed 300TL: sets to 1/60 and aperture to f/5.6 and flash duration is determined by light reflected of off the film plane.

Synchro-sunlight is possible in all the above cases.

4. Canon A & T series flashes: With A and T (not TL) series flashes, set the flashes aperture to f/5.6. The shutter speed will set to 1/60 and the aperture to f/5.6.

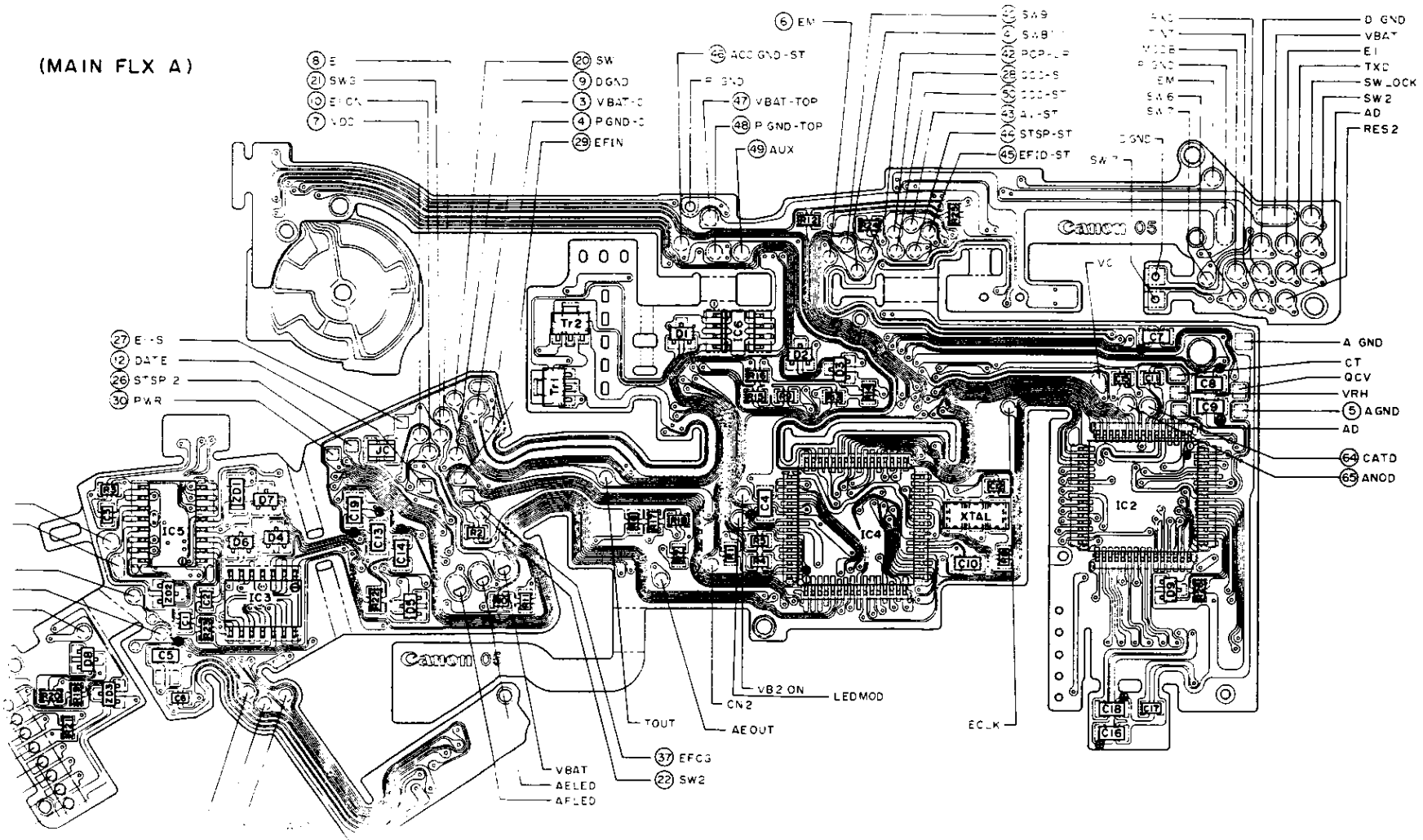
5. Flashes without Canon dedicated contacts cannot be used. (There are no manual shutter speed or aperture settings.)

CANON EOS 850
EOS 750
EOS 750 Q.D.

REF. NO. C12-8042
C12-8052
C12-8053

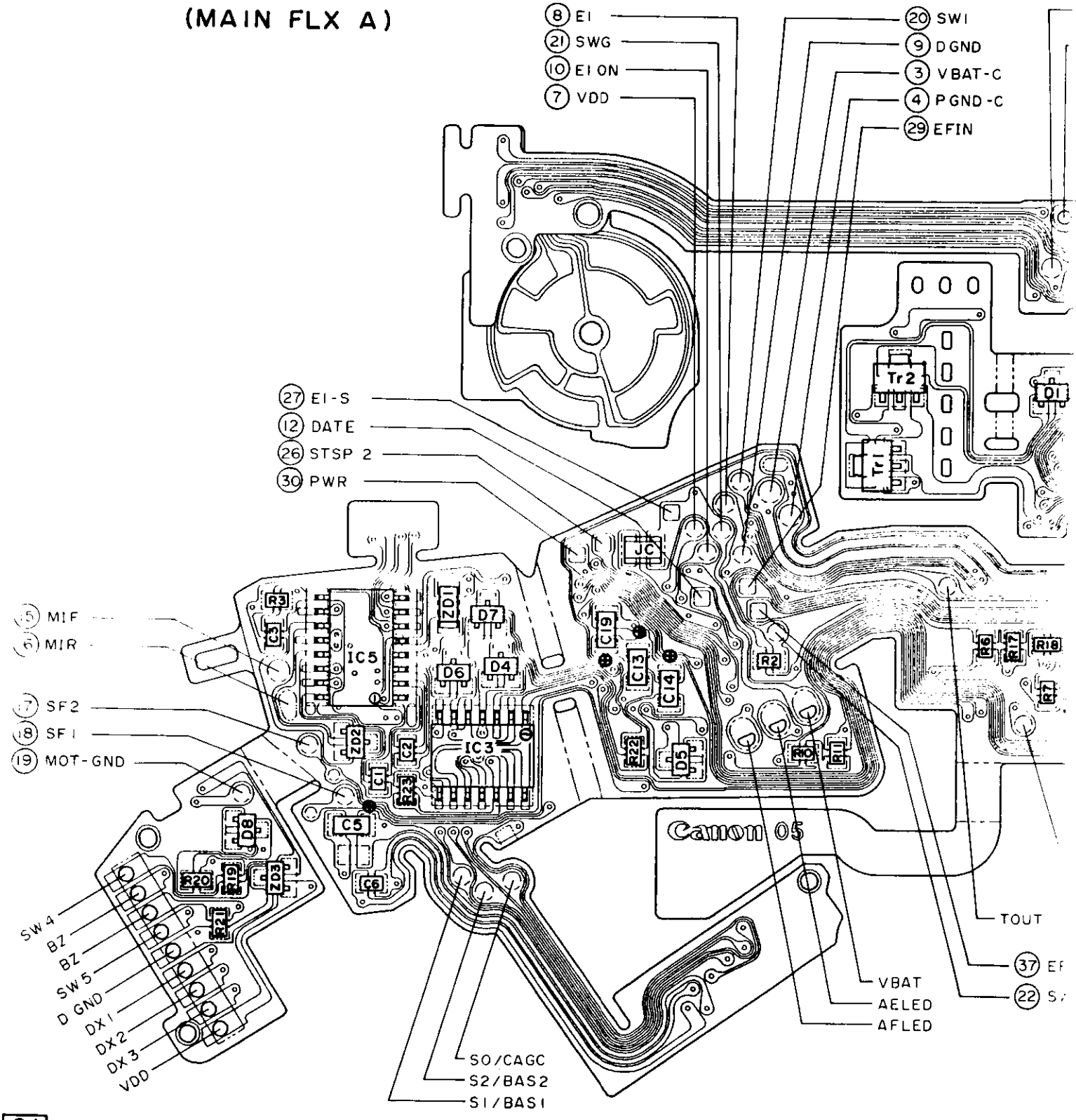
AGRAM

(MAIN FLX A)



P.C.B. DIAGRAM

(MAIN FLX A)



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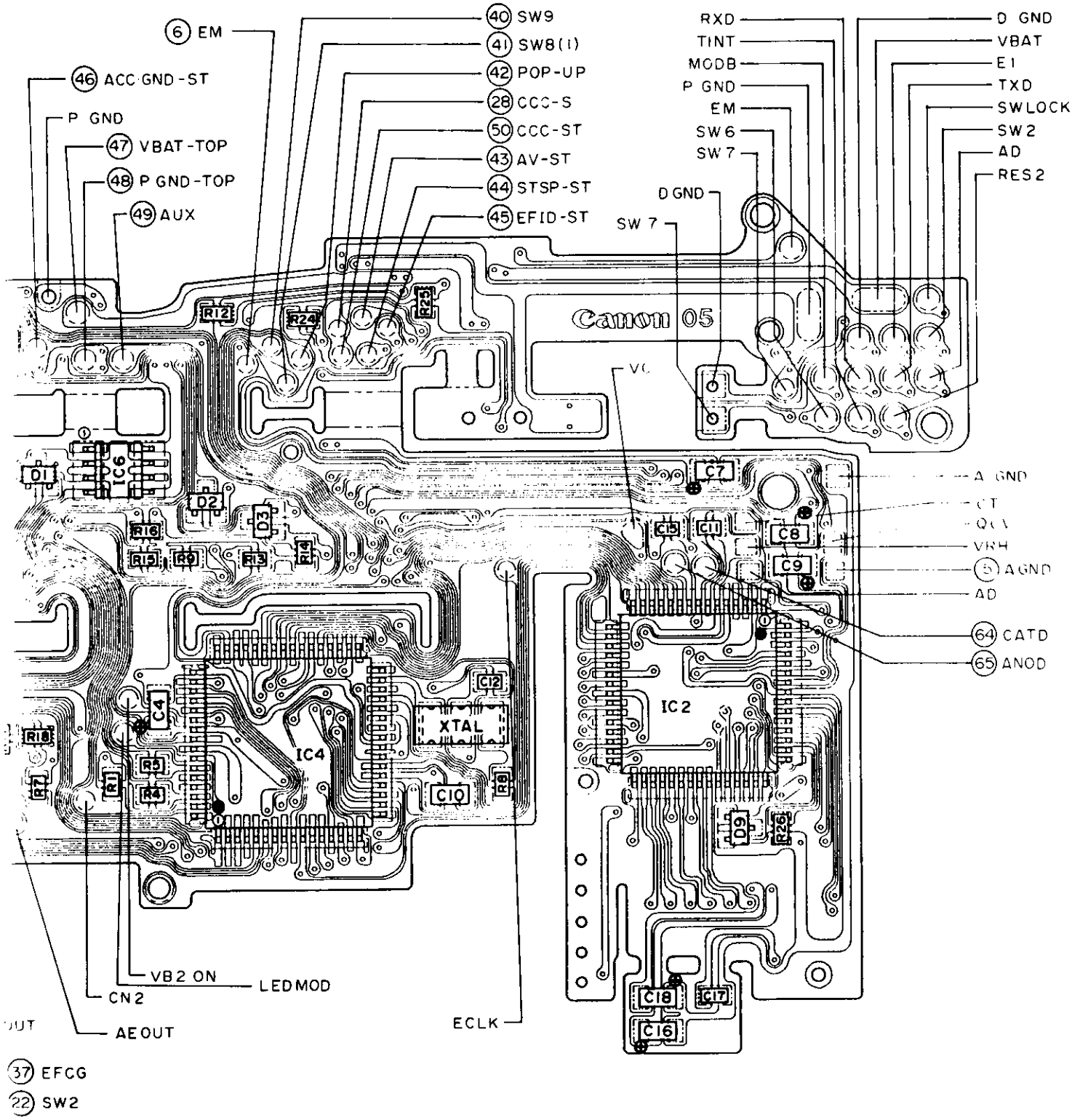

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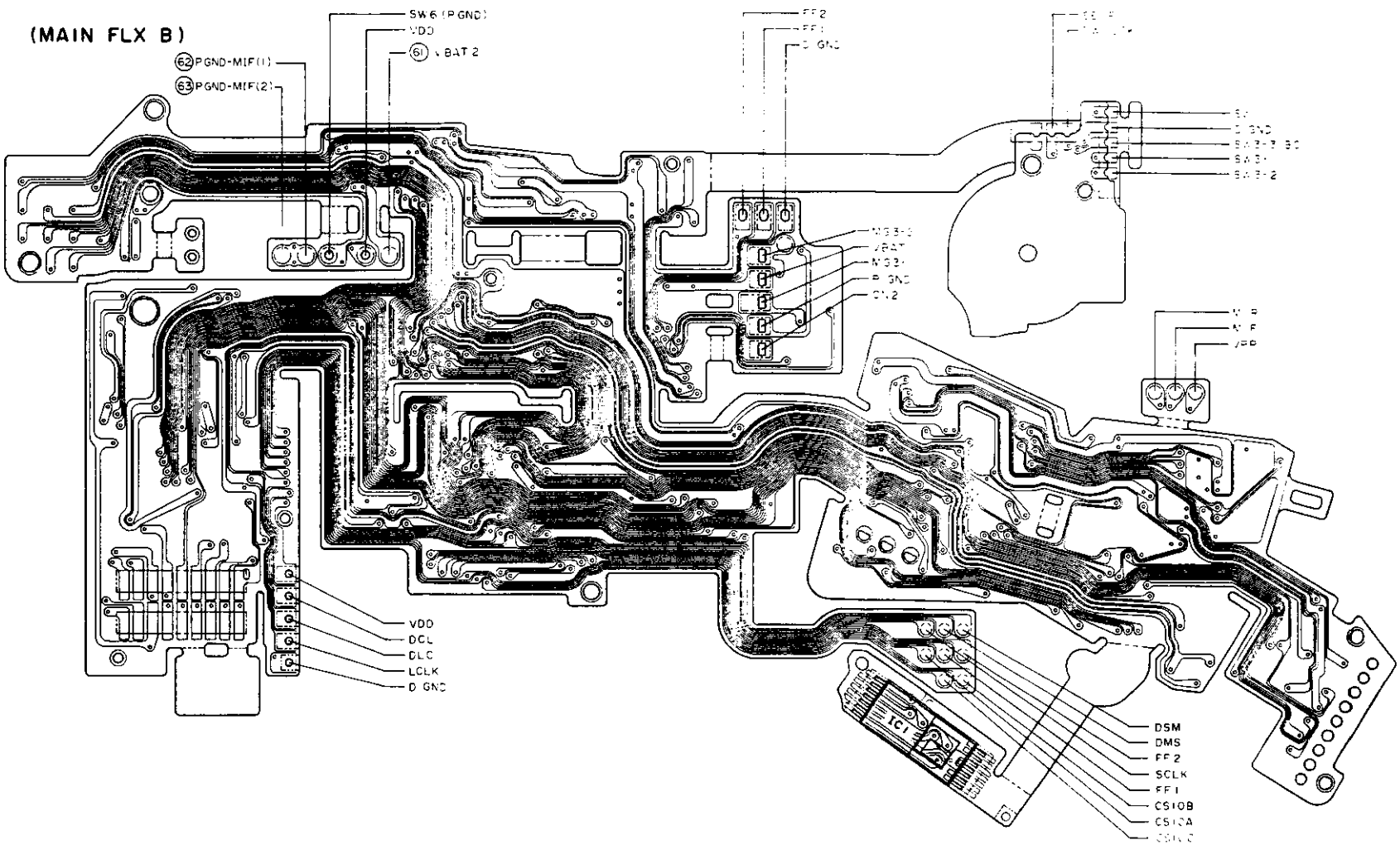
CANON EOS 850
EOS 750
EOS 750 Q.D.

REF NO. C12-80
C12-80
C12-80

DIAGRAM



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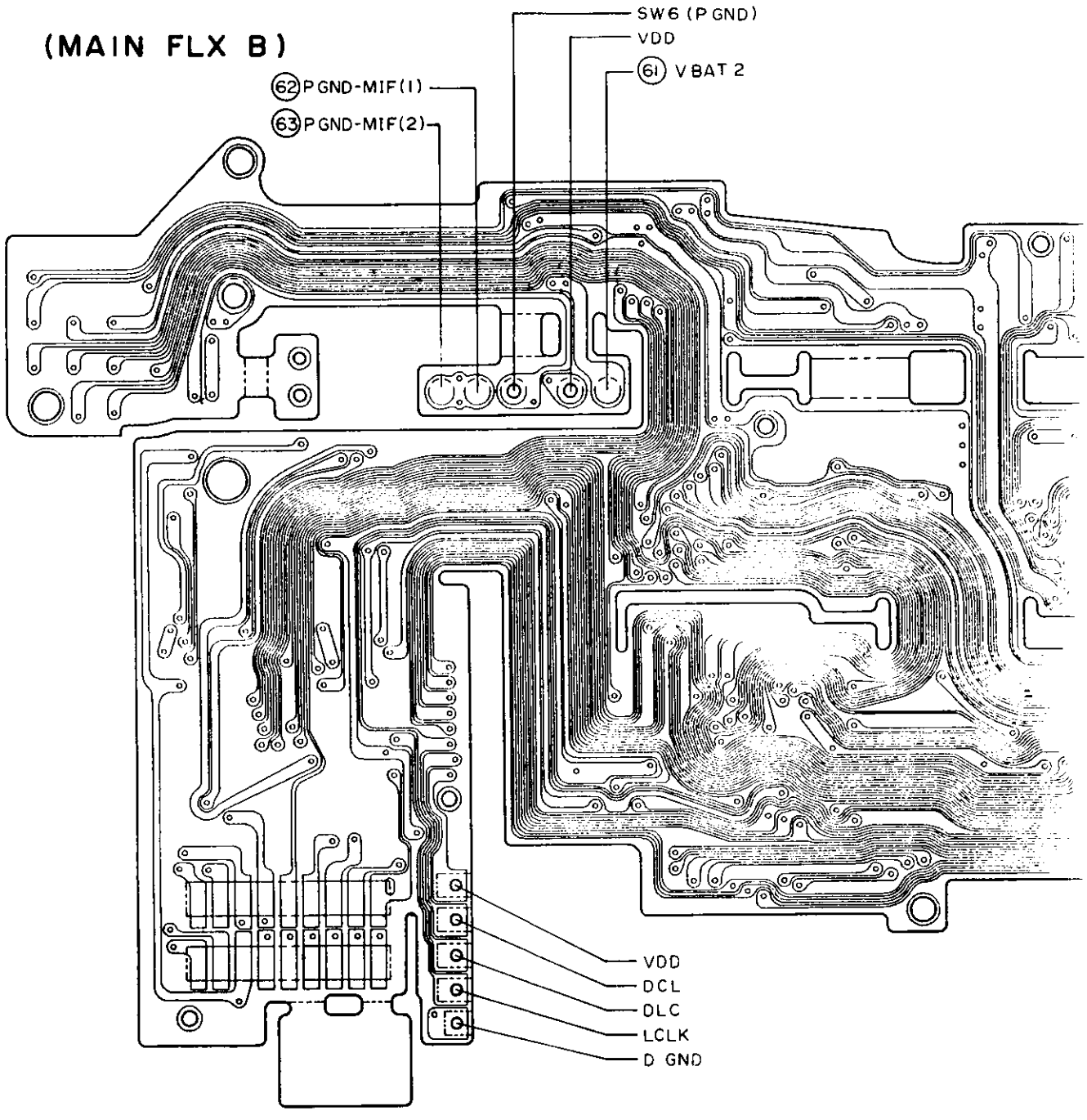
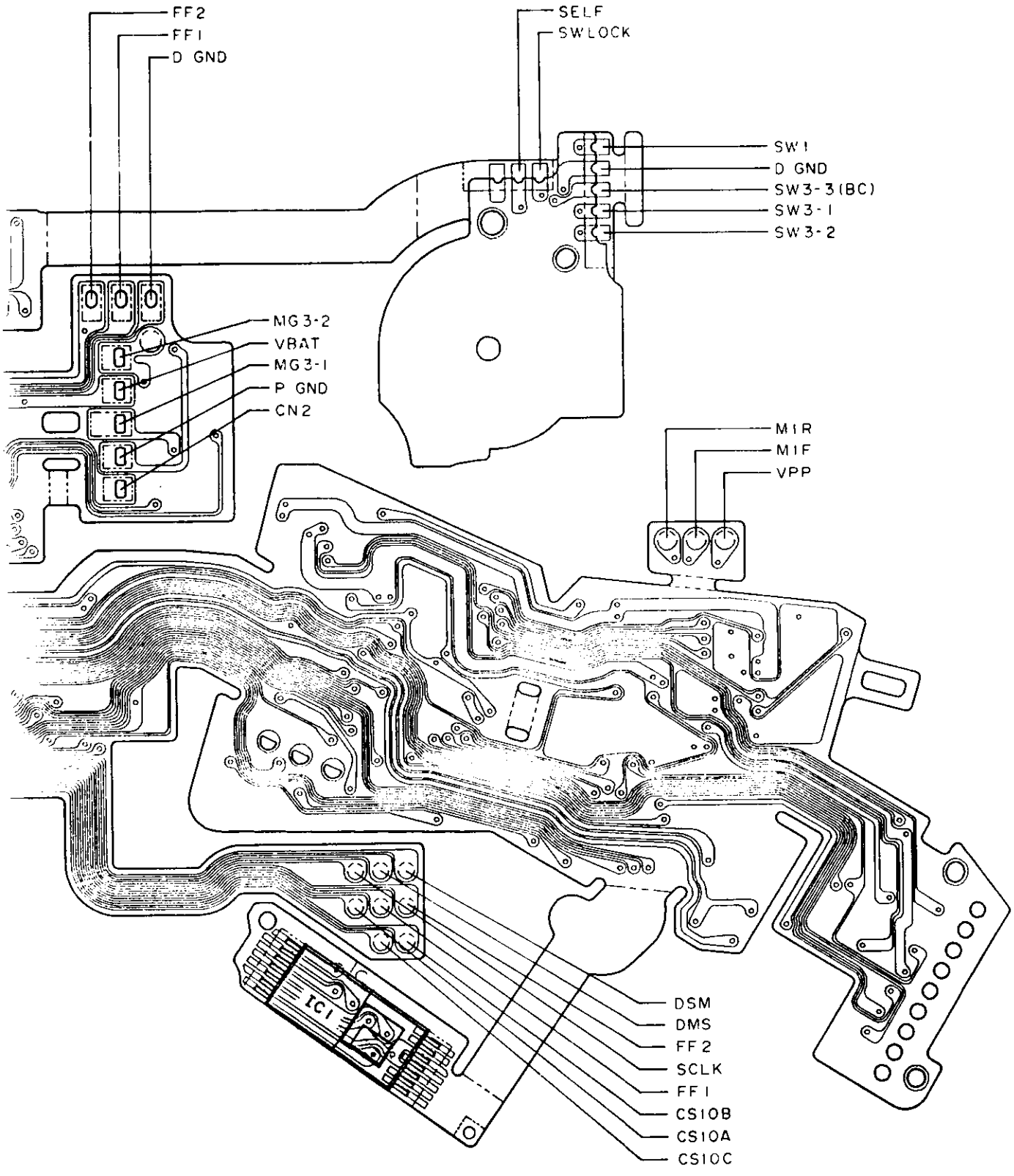

(MAIN FLX B)
SW6 (P GND)
VDD
61 VBAT 2
62 P GND-MIF(1)
63 P GND-MIF(2)
VDD
DCL
DLC
LCLK
D GND

)S 850
)S 750
)S 750 Q.D.

REF. NO. C12-8042
C12-8052
C12-8053



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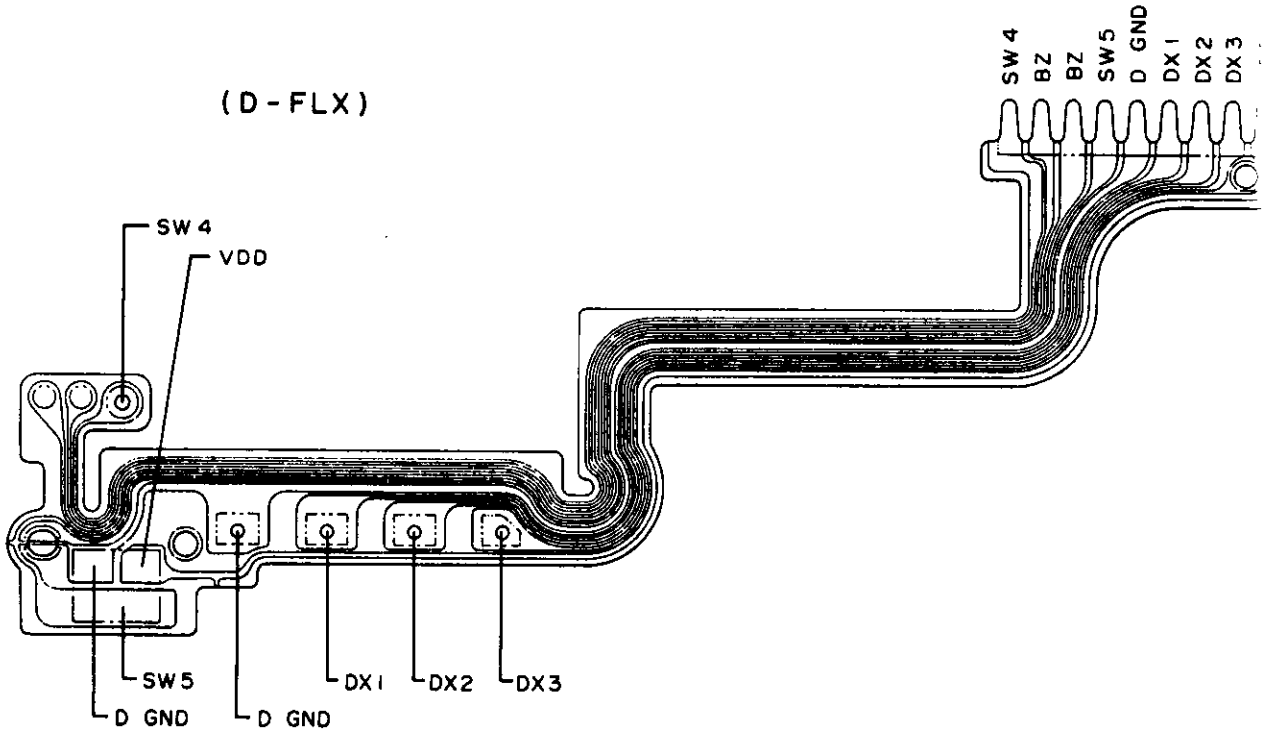
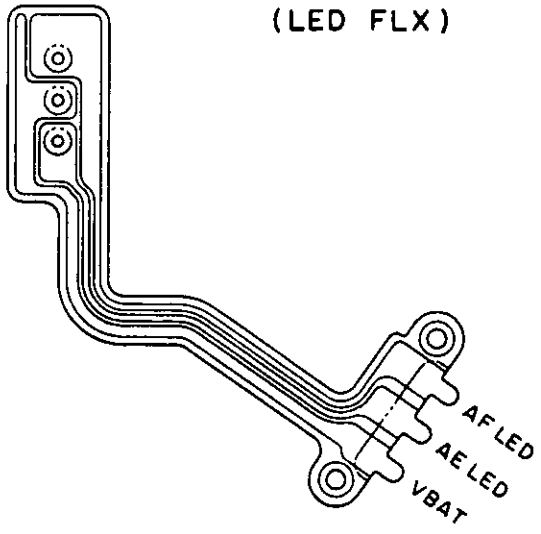
CANON EOS 850
EOS 750
EOS 750 Q.D.

P.C.B. DIAGRAM

(D-FLX)



(LED FLX)



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CANON EOS 850
EOS 750
EOS 750 Q.D.

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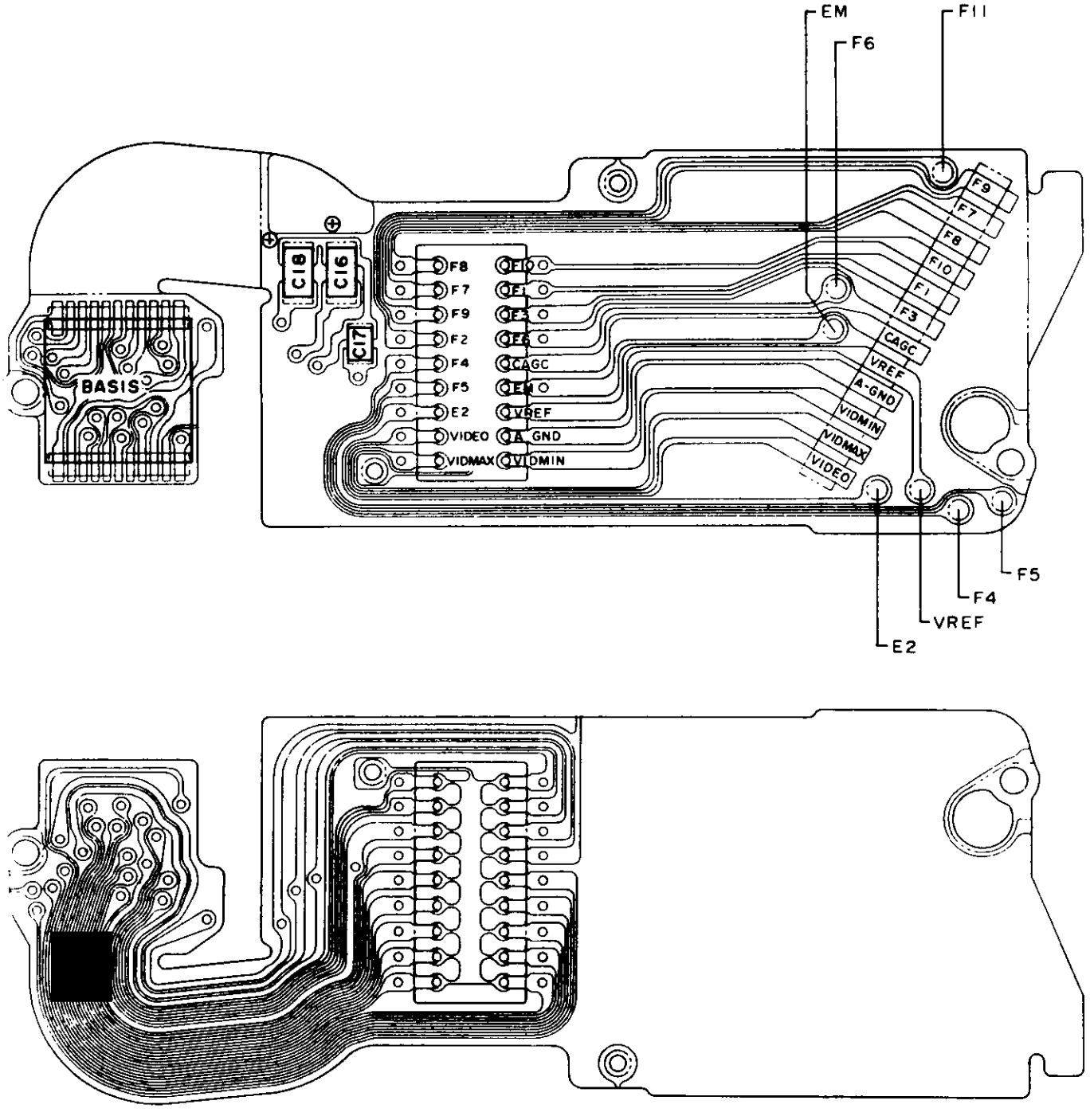
P.C.B. DIAGRAM

(BA FLX)



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CANON EOS 850
EOS 750
EOS 750 Q.D.

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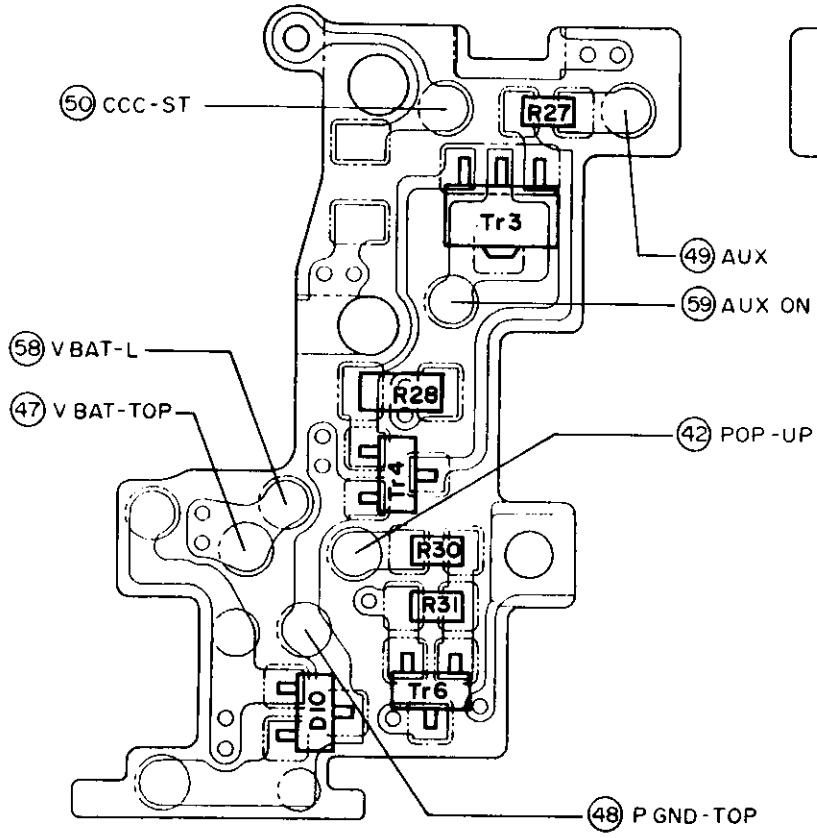
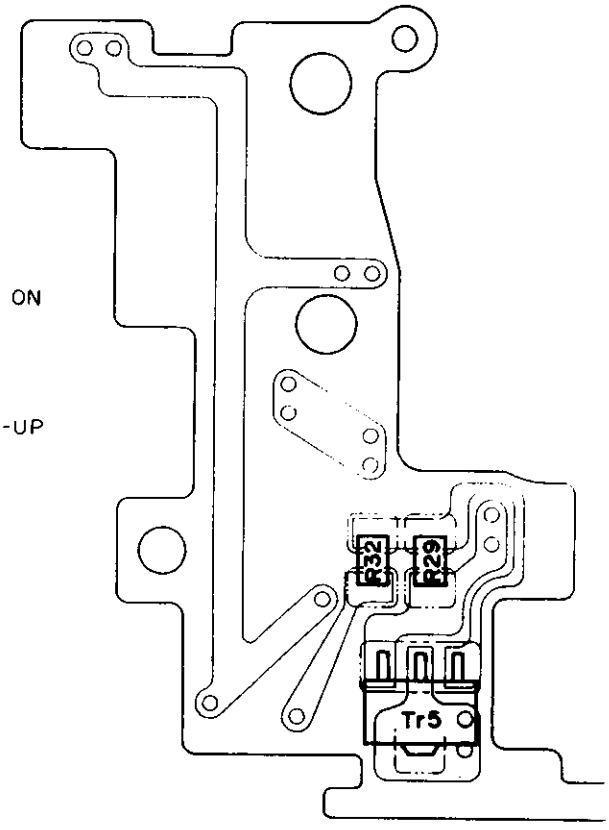
P.C.B. DIAGRAM

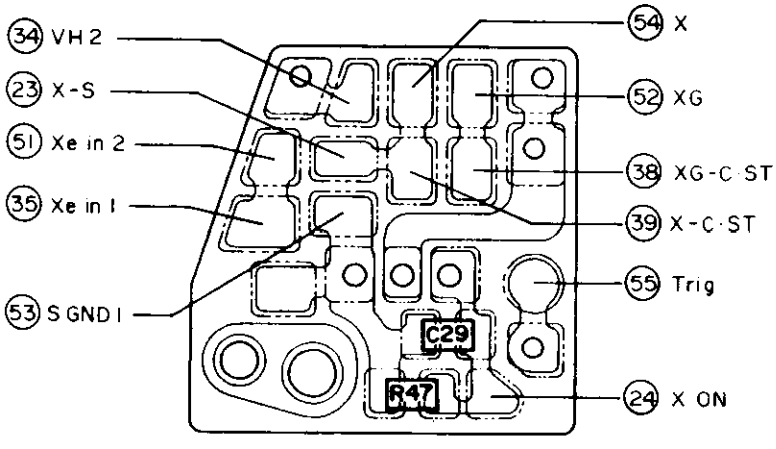
(UPPER BOARD A)



(UPPER BOARD B)



(PENTA BOARD A)



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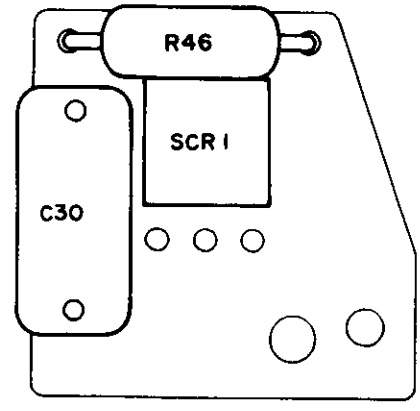

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CANON EOS 850
EOS 750
EOS 750 Q.D.

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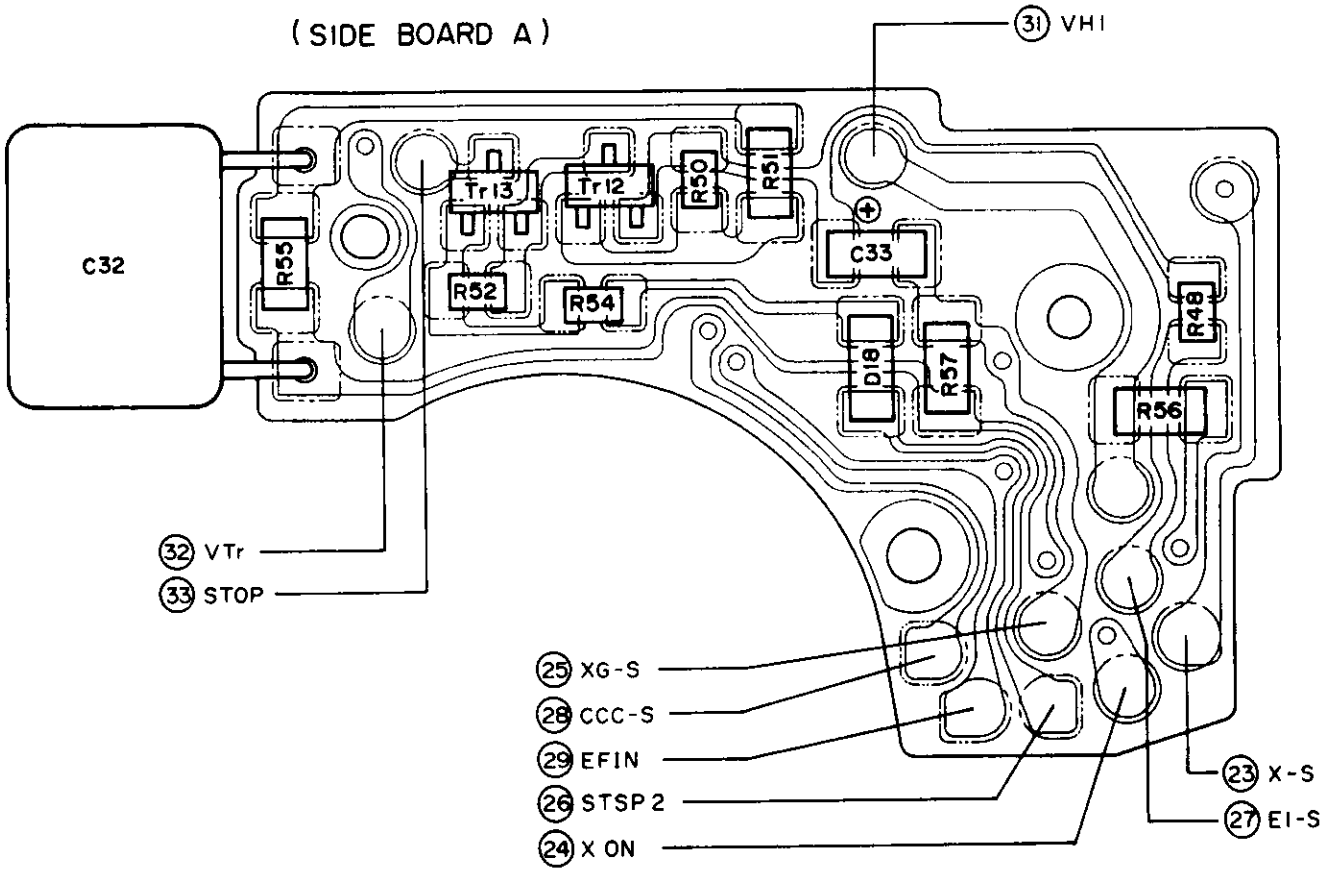

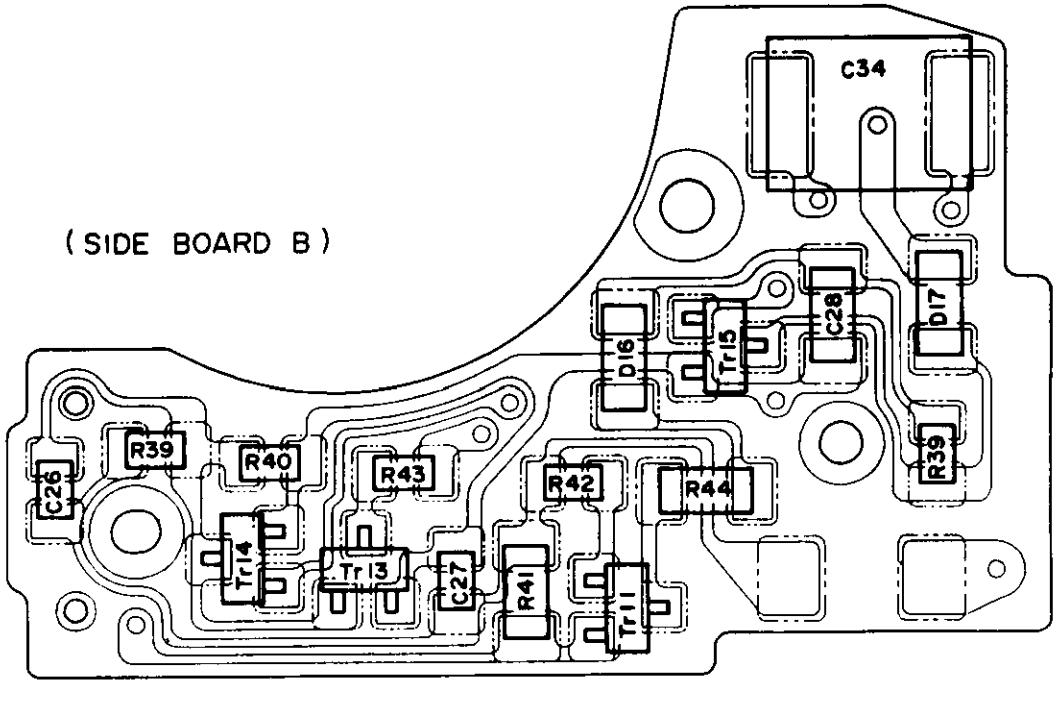

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8-4 Power supply: One 2CR5 6V lithium battery. Fits into grip. No other battery can be used.) Battery can be replaced by removing grip.

8-5 Main switch: "LOCK" on selector dial is the off position.

8-6 Battery check: Beeper beeps eight times a second when battery is good, twice a second when the battery will need replacing soon, and not at all when the battery is exhausted.

8-7 Tripod thread: ¼" / 20 standard (US) tripod socket

8-8 Body material: Glass-fiber reinforced polycarbonate resin

8-9 Body color: Black

8-10 Dimensions: EOS750: 149.3(W) x 102.2(H)* x 69.5(D)** mm
*: 121 (H) with flash activated

EOS850: 149.3(W) x 97.2(H) x 69.5(D)** mm

**: Main body thickness: 50.8mm)

8-11 Weight: EOS750: 620g + 40g battery

EOS850: 560g + 40g battery

9. Related products

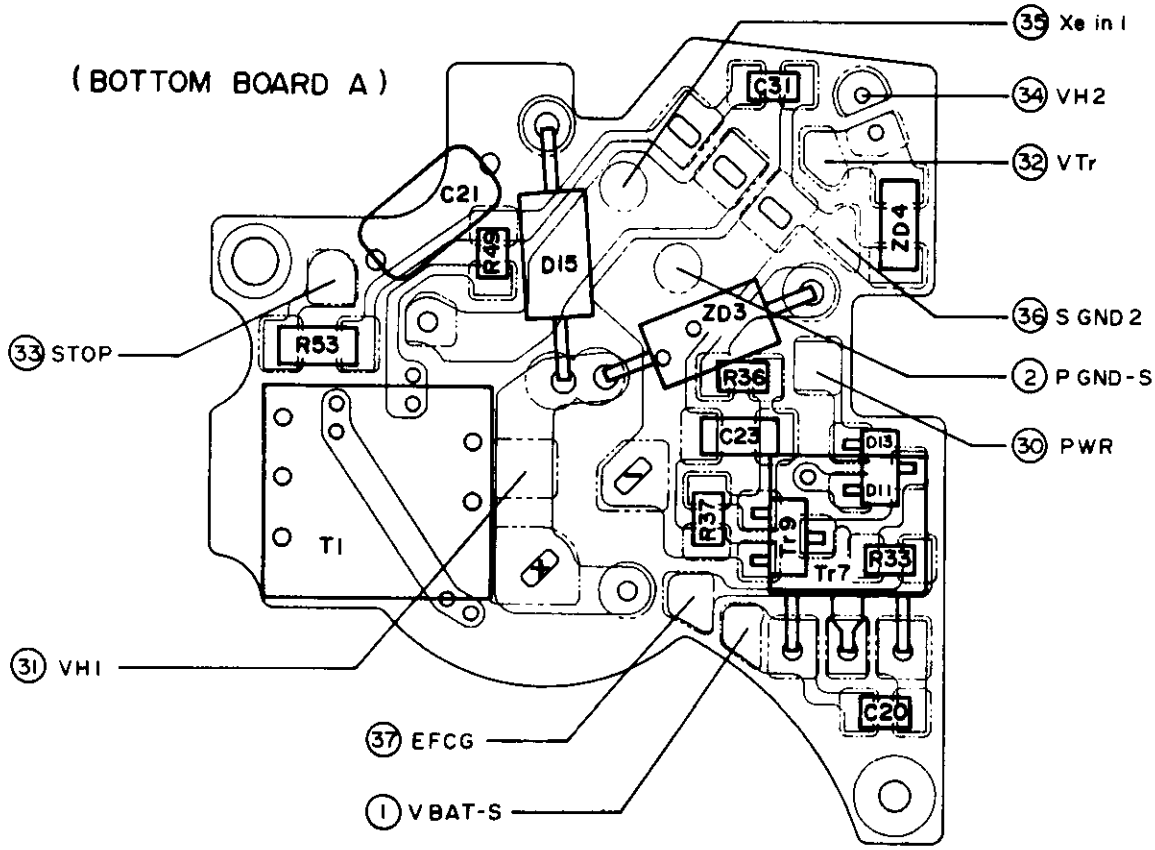
9-1 New accessories:

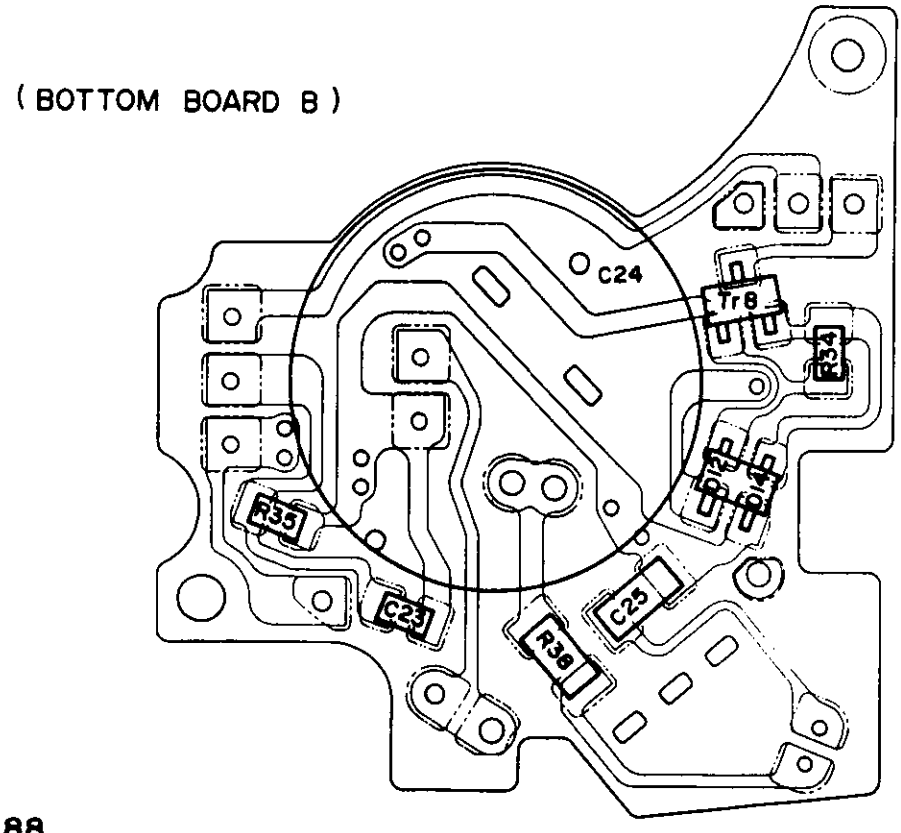
1. Speedlite 160E
2. Three Cases: S, L, and LL

9-2 Compatible accessories: See the system accessory compatibility chart.

CANON EOS 850
EOS 750
EOS 750 Q.D.

P.C.B. DIAGRAM





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SYSTEM COMPATIBILITY CHARTS

Most of the current EOS System components are usable with the EOS 750 / 850 cameras, and a few of the system components for prior SLR systems can be used. The following charts indicate which can be used.

Key to Symbols:

◎ .... Fully Compatible

● .... Limited compatibility as indicated by note number

× .... Not compatible

⊠ .... Not compatible - Exclusive accessory for different model.

Notes:

1. Camera bracket is not completely stable (only one guide engages).
2. Set the flash's aperture to f/5.6.
3. Autofocus is possible with Skylight, UV and ND filters. The maximum number of filters usable is shown in lens charts. Use manual focusing with colored or special effects filters. In-focus indicator is not always reliable.
4. Autofocus should not be used because the additional weight of the close-up lenses is too great a load for the focusing mechanism. Use manual focusing.
5. Use the 'Regular 1X' filter. Do not use 34mm gelatin filter holder.

EOS SYSTEM ACCESSORIES

1. Lens Lineup

No.	Name	Compatibility	Note
1	EF 15/2.8FE	◎	
2	EF 28/2.8	◎	
3	EF 50/1.8	◎	
4	EF 135/2.8SF	◎	
5	EF 300/2.8 L	◎	
6	Extender EF 2X	◎	
7	EF 28- 70/3.5-4.5	◎	
8	EF 35- 70/3.5-4.5	◎	
9	EF 35-105/3.5-4.5	◎	
10	EF 70-210/4.0	◎	
11	EF 50-200/3.5-4.5	◎	
12	EF 50-200/3.5-4.5 L	◎	
13	EF100-300/5.6	◎	
14	EF100-300/5.6 L	◎	
15	EF 50/2.5 MACRO	◎	
16	Life-size Converter EF	◎	

2. Speedlites

No.	Name	Compatibility	Note
17	420EZ	◎	
18	300EZ	◎	
19	ML-3 set	●	2

3. Interchangeable Grip

No	Name	Compatibility	Note
20	One-hand Action Grip GR-10	×	
21	GR20	×	

4. Finder Accessory

No	Name	Compatibility	Note
22	Eyecup E	☒	
23	Dioptric Adjustment Lens E (10 types)	◎	
24	Focusing Screen (7 types)	☒	

5. Data Back

No	Name	Compatibility	Note
25	Quartz Date Back E	☒	
26	Technical Back E	☒	
27	Key Board Unit TB	☒	
28	Interface Unit TB	☒	

6. Filter

No	Name	Compatibility	Note
29	Circle Polarization Filter PL-C52 mm	◎	
30	Circle Polarization Filter PL-C58 mm	◎	
31	Circle Polarization Filter PL-C72 mm	◎	
32	Circle Polarization Filter PL-C48 mm	◎	

7 .Case

No	Name	Compatibility	Note
33	Exclusive Back Case	◎	
34	Exclusive Front Case S	◎	
35	Exclusive Front Case L	◎	
36	Exclusive Front Case LL	◎	
37	Back Case for EOS 620/650	☒	
38	Front Case S for EOS 620/650	☒	
39	Front Case L for EOS 620/650	☒	
40	Front Case LL for EOS 620/650	☒	
41	Soft Case SA-4	◎	
42	Soft Case SB-4	◎	

NON-EOS SLR SYSTEM ACCESSORIES

1. Lenses: No FD or special lenses for earlier SLRs (F-1, T-Series, A-series, etc.) are usable on EOS cameras. Only EF lenses are.

2. Motor Drives, Power Winders, and Remote Control Units:

   None of this class of accessories are usable on the EOS 750, EOS 750QD, or EOS 850 cameras.

5. Data Backs: No previous interchangeable backs are usable.

6. Close Up / Photomacrography / Photomicrography Accessories:

   None of these accessories which mount between the lens and camera are usable. Only close-up lenses, Copy Stands 4 and 5, and Copy Light CL-1 are usable.

3. Finder Accessories

No	Name	Compatibility	Note
1	Exclusive New F-1 type 5 FINDER	×	
2	Exclusive F-1 type 5 FINDER	×	
3	ANGLE FINDER A2(reverse)	○	
4	ANGLE FINDER B (normal)	○	
5	EYEPIECE RG	×	
6	EYE CUP 3R(New F-1)	×	
7	EYE CUP 4S(A series)	○	
8	EYE CUP T (T series)	×	
9	MAGNIFIER R	×	
10	MAGNIFIER S	○	
11	MAGNIFIER AD R	×	
12	MAGNIFIER AD S	○	
13	F-1 FLASH COUPLERS	×	
14	Dioptric Adjustment Lens R	×	
15	Dioptric Adjustment Lens S	○	
	FOCUSING SCREEN		
	for New F-1	×	
	for F-1	×	
	for A-1	×	
	for AE-1 PROGRAM	×	

4. Speedlites

No	Name	Compatibility	Note
1	577G set	●	1.2
2	533G set	●	1.2
3	199A	●	2
4	188A	●	2
5	166A	●	2
8	244T	×	
9	277T	●	2
10	299T	●	2
11	ML-1 set	×	
12	SYNCRO CORD A	×	
13	300TL	●	2
14	300TL ACC for multi flash	●	2
15	ML-2 set	●	2

7. Filters

No	Name	Compatibility	No
1	34mm Drop-in FILTER 8	×	
2	48mm FILTER 17	●	3
3	52mm FILTER 15	●	3
4	55mm FILTER 17	●	3
5	58mm FILTER 17	●	3
6	72mm FILTER 17	●	3
7	SERIES IX 11	×	
8	52,55,58mm SOFT NO.1	○	
9	〃 NO.2	○	
10	52,55,58,72mm PL-L	×	
11	STEP-UP RING 52-55	○	
12	GELATIN FILTER HOLDER set	×	
13	34,48mm GELATIN FILTER HOLDER	●	3

BODY / LENS COMBINATIONS for CASES
(for Semi-hard and Soft Cases)

Three semi-hard cases are made for the EOS 750, EOS 750 QD, and EOS 850. This table lists the smallest case the particular body / lens combination, including one filter, the hood in reversed position, and lens cap as applicable, that will fit into that case.

The three cases are known as small (S), large (L), and extra large (LL). Data are included for the SA-4 and SB-4 soft cases also.

EF Lens f /f/No.	Semi-hard Case	Soft Cases SA-4	Soft Cases SB-4	Notes
Fixed-Focal Length				
15 / 2.8 FE	S	OK		1
24 / 2.8	S	OK		
28 / 2.8	S	OK		
50 / 1.8	S	OK		
50 / 2.5 Macro	S	OK		2
w/ Life Size Conv.	--		OK	
135 / 2.8SF	--		OK	
200 / 1.8L	--	--	--	
300 / 2.8L	--	--	--	
600 / 4.0L	--	--	--	
Zoom Lens				
28-70 / 3.5-4.5	L	OK		
35-70 / 3.5-4.5	L	OK		
35-105 / 3.5-4.5	LL		OK	
35-135 / 3.5-4.5	LL		OK	
70-200 / 4.0	--	--	--	
50-200 / 3.5-4.5	--	--	--	
50-200 / 3.5-4.5L	--	--	--	
100-300 / 5.6	--	--	--	
100-300 / 5.6L	--	--	--	

Oct., 1988

Notes: 1. No hood or filter for this lens.

2. No hood for this lens.

Specification Comparison of four EOS Bodies

↓ Items ➡ Model			EOS 750	EOS 850	EOS 650	EOS 620
AF	One shot		●	●	●	●
	Servo		—	—	●	●
	Manual		●	●	●	●
	Focus indication	LED	●	●	●	●
		Sound	●	●	●	●
	Working brightness (EV)		+1~18	+1~18	+1~18	+1~18
Viewfinder	Magnification (50 mm/∞)		0.8×	0.8×	0.8×	0.8×
	Screen Replacement		—	—	● (7)	● (7)
	Information display		LED	LED	LCD	LCD
	Depth of field check		—	—	●	●
Light metering system	Evaluative		●	●	●	●
	Partial		—	—	●	●
	Light metering range (normal temperature)		0~20	0~20	0~20	0~20
	film speed (ISO)		25~3200	25~3200	6~6400	6~6400
Autofocus	Shutter-priority AE		—	—	●	●
	Aperture-priority AE		—	—	●	●
	Depth-of-field AE		●	●	●	●
Exposure Compensation (Automatic Exposure Bracketing)	Program	Intelligent	●	●	●	●
		Manual-shift	—	—	—	●
	Manual		—	—	●	●
	A-TTL automatic flash aperture		● (420-300 EZ)	● (420-300 EZ)	●	●
	TTL automatic flash aperture		●	●	●	●
	AEB		—	—	—	●
	Manual set		—	—	●	●
	AE lock		●	●	●	●
Multiple Exposure (preset)			—	—	—	●
Shutter	Speed range (second)		1/2000~2	1/2000~2	1/2000~30•B	1/4000~30•B
	X-sync. speed (second)		1/125~1/60	1/125~1/60	1/125~30•B	1/250~30•B
film transport based on 24-exp.film (continuous exposure)	Full auto position		●	●	●	●
	Winding speed (fps)		1.2	1.2	3	3
	Pre-winding system		●	●	—	—
	Winding speed (second)		(14)	(14)	10	7
	Battery life (roll)		40 (30 flash use)	75	75	75
Flash	Built-in (GNo.)		● (12)	—	—	—
External display			Dial	Dial	LCD	LCD
Power source			2CR5	2CR5	2CR5	2CR5
Remote control			—	—	(O)	●
Dimensions (W × H × D)			149.3 × 102.2 × 69.5	149.3 × 97.2 × 69.5	148 × 108.3 × 67.5	148 × 108.3 × 67.5
Weight (without battery)			620 gr.	560gr.	660 gr.	700 gr.
Sales date			1988.10	1988.10	1987.3	1987.3
Price (¥)			62,000(QD)	48,000	80,000	108,000

SPECIfiCATION COMPARISON WITH COMPETITORS

Items → Manufacturer ↓ → Model			Canon EOS 750	Nikon 4004 F-401	Kyocera (Yashica) 210-AF	Pentax SF 1 SFX	MINOLTA 3000i α-3700i
AF	One shot		●	●	●	●	●
	Servo		—	—	●	●	–
	Manual		●	●	●	●	●
	Focus indicator	LED	●	●	●	●	●/●
		Sound	●	—		●	●
	Working brightness (EV)		+1~18	+2~18	+2~20	+2~18	0～18
Viewfinder	Screen Replacement		—	—	● (4)	● (3)	–
	Information display (LED)		●	●	●	●	●
Metering system	Evaluative		●	●(3)	—	—	▲(2)
	Center-weighted Average		—	●	●	●	–
	Light metering range (normal temperature)		0~20	+1~19	+1~20	+1~18	1～20
	Film speed (ISO)		25~3200	25~5000	25~5000	6~6400	32～3200
Autofocus	Shutter-priority AE		—	●	●	●	▲(H·P)
	Aperture-priority AE		—	—	●	●	–
	Depth-of-field AE		●	●	●	●	–
Exposure Compensation	Intelligent Program AE		●	▲ (2)	▲ (2)	▲ (5)	●
	Manual		—	●	●	●	–
	A-TTL automatic flash aperture		●	—	—	—	–
	TTL automatic flash aperture		●	●	—	—	●
	AE lock		●	●	●	—	●
Shutter	Speed range (second)		1/2000~2	1/2000~1.8	1/2000~8·B	1/2000~30·B	1/1000～4
	X-sync. speed (second)		1/125~1/60	1/100~1·B	1/90~8·B	1/100~30·B	1/60
Film transport based on 24-exp.film (continuous exposure)	Full automatic		●	▲	▲	▲	●
	Winding speed (fps)		1.2	2.5	1.8	1.8	
	Prewinding system		●	—	—	—	–
	Rewinding speed (second)		(14)	16		24	12
	Shooting capacity (no. of rolls)		40(30%)	75/30(50%)	25(50%)	55/25(50%)	200 (cont.)
	Built-in		●	●	—	●	–
Flash (built-in or pentaprism integrated type)	Integrated		●	●	●	—	–
	Automatic pop-up/retract		●(M-OFF)	M-ON, OFF	M-ON, OFF	M-ON, OFF	▲(M·SW連動)
	GNo. (ISO100/m)		12(Parallel)	12 (Parallel)	11	14 (Parallel)	16
	Coverage Angle (mm)		35	35	35	35	35
	Flash Aperture Control		TTL-P	TTL-P,TTL	(CPU)	TTL	TTL
	Automatic brightness control		●	●	×		●
	Coupling range		1.0~4.3 m (f/2.8)	1.4~4.2 m (f/2.8)	0.7~6.0 m (f/1.8)	0.6~5.0 m (f/2.8)	0.7～5.7
	Recycling time		2	4.5	2.5	3.0	
	Automatic flash in low light condition		●	warning only	warning only	warning only	●
	Automatic flash in backlit condition		●	warning only			●
	Distance(optical axis-flash elemet)		70.5 mm	70.0 mm	60.0 mm (230AF)	63.0 mm	
	AF auxiliary light		●	×	×	●(4 m/13.1 ft.)	●
	Power supplied by body battery		●	●	●	●	●
Power source			2CR5	AA × 4	2CR5	BR-P2D/AA × 4	2CR5
Dimensions (W × H × D)			149.3 × 102.2 × 69.5	154 × 102 × 65.5	148 × 93 × 50.5	157 × 99 × 63.5	142 × 88.5 × 60.5
Weight (without battery)			620g	645g	575g (including flash)	665g	420g
Sales date			1988.10	1987.6.10	1987.10.3	1987.3	1988.
Price (¥)			62,000(QD)	64,000	64,000	80,000	45,000

NOTES CONCERNING USE

Operational Precautions

No.	Special consideration	Explanation (——>: Proper action)
1.	When using the integral flash, manual focus with USM lenses is not possible after the shutter button is pressed or while the flash is charging.	The battery cannot power the USM lens and flash simultaneously. ——> Focus the lens before pressing the shutter button, or don't use the internal flash.
2.	With the EF 135mm f/2.8SF, soft focus cannot be changed after autofocus is completed.	The focus points for soft focus and normal focus are different so soft focus must be set before autofocus.
3.	The auxiliary AF Illuminator cannot be used without using flash.	The metering program is different in autoflash and flash-off modes. If the flash is turned off after AF illumination but before the flash fires, the camera will focus and meter again. ——> To use the AF Illuminator with out flash, after the illuminator fires and the lens focuses, set the lens to manual before turning the flash off.
4.	If, after a roll is finished, and rewound,but before the back cover is opened, the shutter button is pressed, the battery checked, the AF mode changed, or the lens removed, an autoloading failure will be indicated (pi-pi-pi-pi).	Due to design. The sequence has been completed and the camera senses a roll of film is loaded, but it cannot load it properly since there is no leader protruding. It determines that misloading has occured.
5.	The number of exposures on a roll may exceed the indicated number.	Unlike EOS 650 and 620, but normal for most cameras, depending on actual film length, not the film counter.
6.	If the integral flash is manually pushed down while SW-1 is held on the camera believes that the flash was never deployed and the latch release magnet operates with a click, click, click sound. If pressure is removed from the flash, it will deploy. If SW-1 is released, the flash will latch in the retracted position.	Due to design. (Misoperation)

NOTES CONCERNING USE

Operational Precautions

No.	Special consideration	Explanation (——>: Proper action)
7.	Continuing from (6.) above, if shutter is released with the integral flash manually held down, the camera stops in the mirror-up position. The latch magnet sound stops and a four second audible warning is heard.	Due to design. (Misoperation) ——> If SW2 goes off, but SW-1 stays on, the mirror returns and the (5.) condition returns. (Exposure nor winding occur.
8.	If the back cover is opened and and the film removed before the camera rewinds it, and another roll installed without closing the back cover, the new roll will be rewound instead of loaded.	Due to design, the sequence has not completed. ——> Closing the back cover once clears the sequence.
9.	Even when the integral flash is not used, it quivers slightly when the shutter charges.	Due to design. The flash latch, shutter charge, mirror mechanism, and flash retracting link are all tied together.

Improper Operation leading to Hardware or Software Problems

No.	Special consideration	Explanation
1.	Do not use a lens hood with the integral flash unit.	The lens hood will cut off the lower part of the flash beam causing underexposure of the lower part of the picture. (Worst case: EF300mm f/2.8L)
2.	Be sure that the integral flash is down before attaching another	The retraction mechanism may be damaged if a flash is forced into the hot shoe with the flash up.

DESIGN SPECIFICATIONS

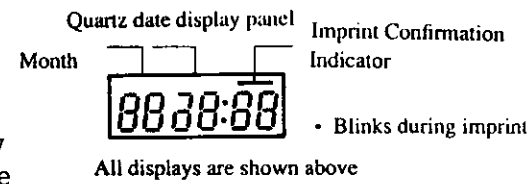
(Only data related specifications are listed here. All other specifications are the same as the EOS 750.)

1. General

1-1 Type: Full-frame 35mm AE/AF single-lens-reflex camera with power winder, focal plane shutter and date imprinting back cover with automatic calendar quartz controlled clock.

1-2 System Quartz crystal controlled microcomputer clock, LCD driver and two LCDs, transparent for data imprinting and an opaque external indicator, mini-lamp and a lithium cell for power.

2. Automatic calendar clock: Programmed from 1987 through 2019. Accuracy better than 90 seconds a month at normal temperatures.



3. Data recording

3-1 Variations:
1) Year, month, day
2) Day, hour, minute
3) No imprint (-- -- -- on indicator)
4) Month, day, year
5) Day, month, year

Variations occur in above sequence. All data appear in numerals only.

3-2 Externaldisplay Six 7-segment digits

3-3 Imprint area: Bottom right corner of the frame with characters arranged horizontally. On the negative, character height is about 0.65 mm.

3-4 Imprint system: Recording is automatic and coupled to photography. A miniature lamp exposes through a transparent LCD and the base of the film onto the emulsion.

3-5 Verification: Verification mark (-) appears on the display LCD for 2 to 3 seconds.

3-6 Exposure: Incremented to DX film speed (Five steps)

4. Battery: One lithium cell, CR2025 (3V); Life approximately 3 years

5. Dimensions and Weight: 149.3(W) x 102.2(H) x 71.0(D)* mm 635g**
*: Body + QD thickness: 53.6mm)
**: Includes QD but not camera battery

7. Case: Same as EOS 750 and EOS 850

NOTES CONCERNING USE

Camera Operations after Operator Misoperations and/or Battery Failures

No.	Improper operation	Camera Operation
1.	If the back cover is opened by accident with film loaded.	When the back cover is opened, the mechanical frame counter resets, but the electronic counter retains the winding data so the remaining frames can be exposed with the loss of only two to three frames.
2.	If prewind stops before it is finished, due to battery failure.	The number of frames advanced before the battery failed is held in the memory, prewinding will resume when a new battery is installed and the shutter button pressed to turn on SW1. (Pressing the shutter button completely has no ill effect.
3.	If the battery dies during photography.	The number of frames remaining to be exposed is in the frame counter memory so operation continues normally when a new battery is installed.
4.	If the flash switch is set to Off after the flash has deployed.	Normal AE photography will take place (the flash will not fire), when the shutter button is pressed and the flash will retract during winding.
5.	If the flash is manually pushed down during self-timer operation.	It will latch in the down position, but will deploy again before exposure and the exposure information determined prior to self-timer operation will determine exposure.

MID-ROLL FILM REWIND

Mid-roll rewind is not mentioned in the I.B. If a user specifically ask how to rewind a partially exposed roll, tell the person to:

1. Attach the lens cap.
2. Set the lens to manual focus.
3. Set the flash switch to Off. (750)
4. Press the shutter the required number of times until the leader rewinds into the cartridge.

You may also use this method, although we do not advise it for customers.

1. Remove the lens.
2. Holding the selector dial at the battery check mark, depress the shutter button for at least 1.5 seconds.
3. The mirror will cycle once and the film rewind.

SPEEDLITE 160E (C50-0641)

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FEATURES

Completely Automatic -No user controls

The first stroke of the shutter button serves as the flash power switch. It fires automatically when needed (low light or backlight). TTL-OTF flash control. No user adjustments.

Quick Flash

Uses 2CR5 Lithium Battery for fast recycling (0.3 to 0.7 seconds).

Light and compact

Only 26.5mm thick - fits in pocket where you used to carry cigarettes before you got smart and quit.

DESIGN SPECIFICATIONS

1. Type: Compact, fixed-head, hot-shoe mounting, completely automatic electronic flash especially for the EOS 850 and usable on other EOS models.

2. Usable on: EOS 850/750 (See section 4 concerning limited use on other models)

3. Guide Number @ ISO 100, meters: 16

4. Flashes per battery: 400 to 4000

5. Recycling time:

Normal Flash	Quick Flash
0.3 to 1.7 sec.	0.3 to 0.7 sec.

6. Flash Coverage: 35mm Lens (Parallax: 3° downward slant)

7. Control System:

7.1 Flash Modes: When the evaluative metering system of the camera (EOS 850/750) detects low light or backlighting, exposure is determined through the lens (TTL auto flash).

7.2 Aperture Setting: Determined by camera TTL Flash program.

7.3 Speed Setting: Automatically set the 1/60 - 1/125.

7.4 Exposure Control: TTL automatic flash

7.5 Flash Duration Control: TTL - OTF reflected flash metering

7.6 Fill-in Flash: Automatic adjustment for syncro-sunlight flash

7.7 Flash Coupling Range (ISO100):

Quick Flash	Normal Flash
0.7 to 2.8 m	0.7 to 5.6 m

7.8 Coupling Range Warning: None

8. Flash Ready Indicators: Quick Flash — Yellow LED; Normal Flash — Red LED

9. Sync Timing: 1st Curtain

10. Flash Duration: < 1ms

11. Color Temperature: Approx. daylight

12. Film Speeds: Determined by camera (ISO 25 to 1,600), Coupling range is directly related to film speed.

13. AF Illumination Beam:

13.1 Source: Ultra-bright red LED

13.2 Pattern: Random vertical stripes

13.3 Effective Range: 1 to 5 meters in total darkness

14. Power Control: Camera's SW1 (shutter button) serves as main power switch. "Post-charge" functions automatically to partially charge capacitor and shorten next charging time. Automatic energy-saving (SE) function cuts flash off automatically after 8 seconds.

15. Power Supply: 2CR5 Lithium battery (6 volts)

16. Camera Interface:

16.1 Mechanical: Fixed, non-locking, hot-shoe mount

16.2 Electrical: Canon EOS coupling (center X contact, ground, and four dedicated contacts.

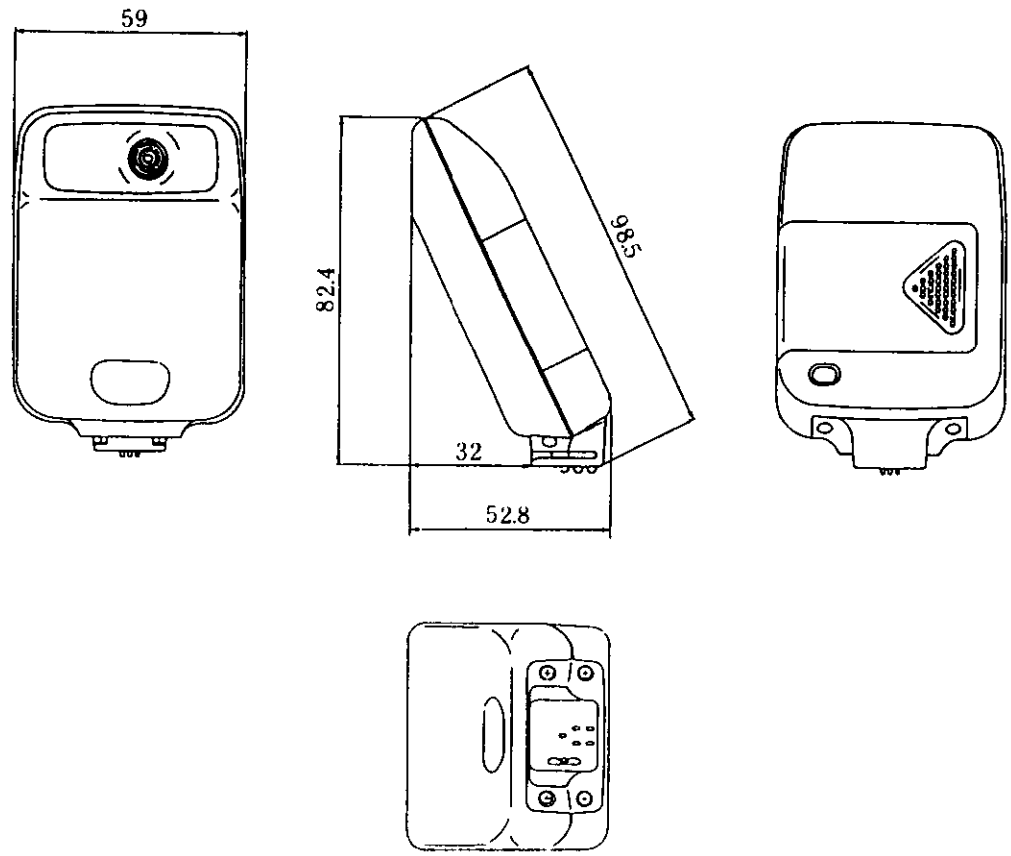
17. Dimensions and Weight:

Width	Height	Depth	Weight
59 x	82.4 x	52.8 mm;	85g, (125g with battery)

18. Flash Coupling Range: (35mm lens)

f/No.	ISO 25	ISO 100	ISO 400	ISO 1600
* 2.0	1.0 – 4.0	2.0 – 8.0	4.0 – 16.0	8.0 – 32.0
2.8	0.7 – 2.8	1.4 – 5.7	2.9 – 11.3	5.7 – 22.6
3.5	0.7 – 2.4	1.1 – 4.8	2.3 – 9.5	4.6 – 19.0
4.0	0.7 – 2.0	1.0 – 4.0	2.0 – 8.0	4.0 – 16.0
4.5	0.7 – 1.7	0.9 – 3.4	1.8 – 6.7	3.6 – 13.5
5.6	0.7 – 1.4	0.7 – 2.8	1.4 – 5.7	2.9 – 11.3
8.0	0.7 – 1.0	0.7 – 2.0	1.0 – 4.0	2.0 – 8.0
11.0		0.7 – 1.4	0.7 – 2.8	1.5 – 5.7
16.0		0.7 – 1.0	0.7 – 2.0	1.0 – 4.0
22.0			0.7 – 1.4	0.7 – 2.8
32.0			0.7 – 1.0	0.7 – 2.0

Maximum aperture usable with 620/650 is f/2.



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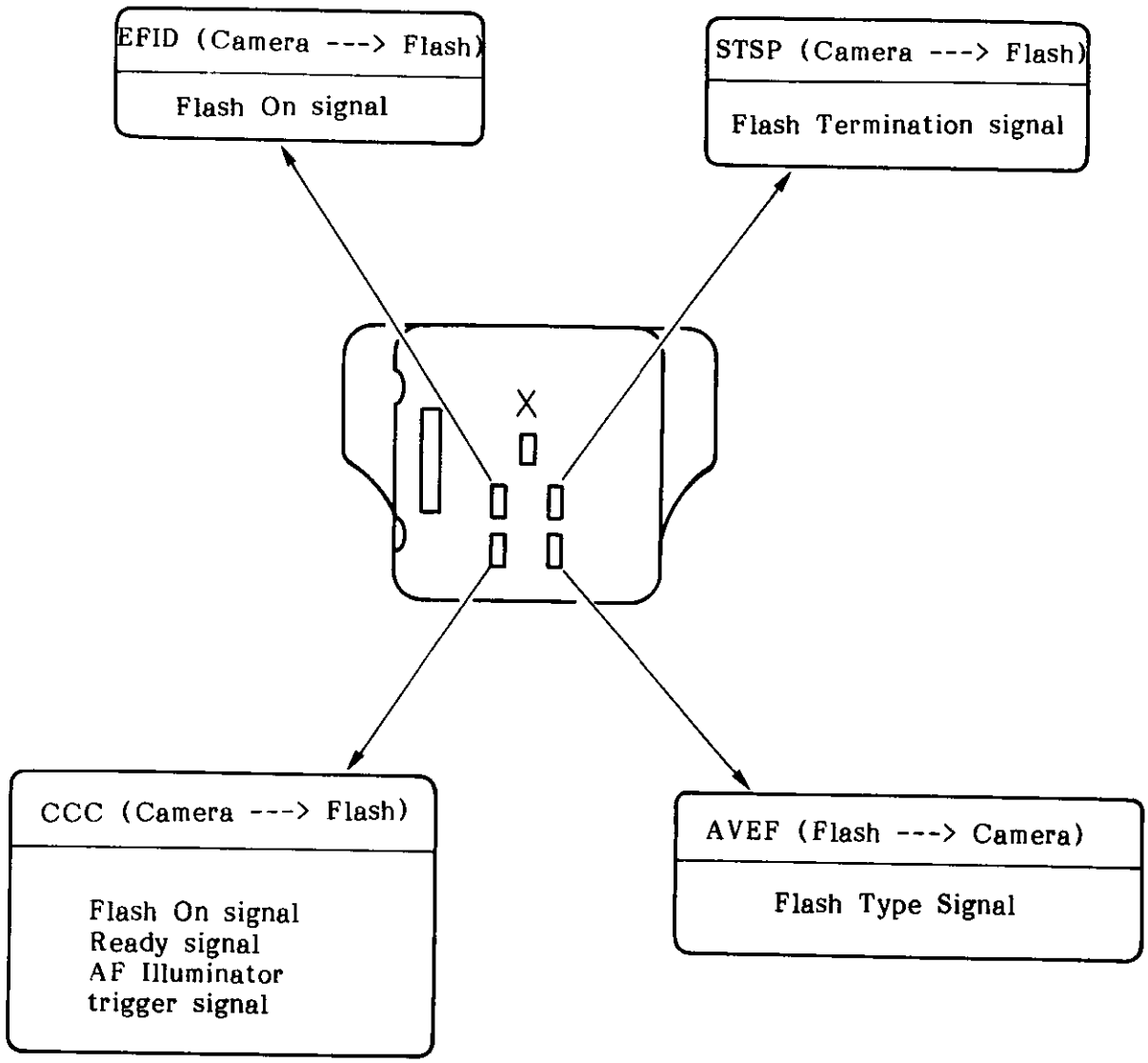
DATA COMMUNICATIONS

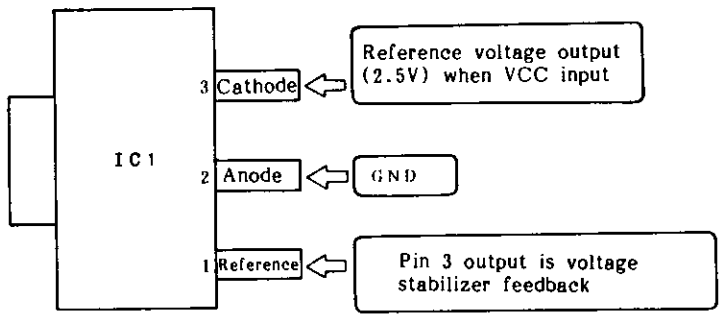
Between the flash and the camera data flows through four terminals. EFID, CCC, AVEF and STSP. Since the 160E has only one mode, TTL automatic flash, it doesn't need serial digital communication, which is used in the the Speedlites 300EZ and 420EZ for the EOS camera series.

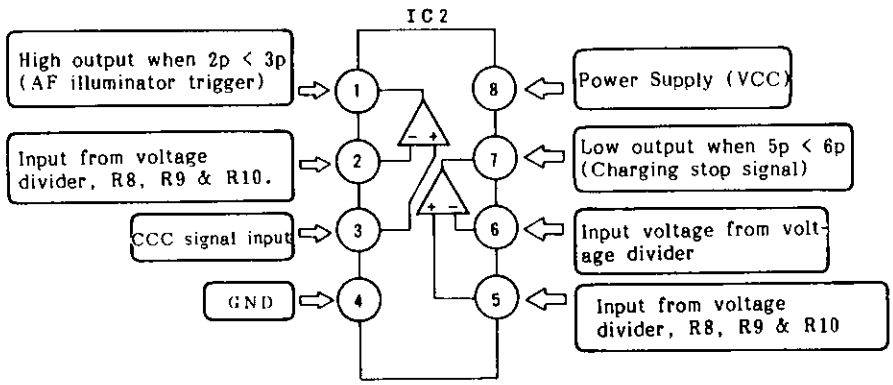
The main data communications are as follows.

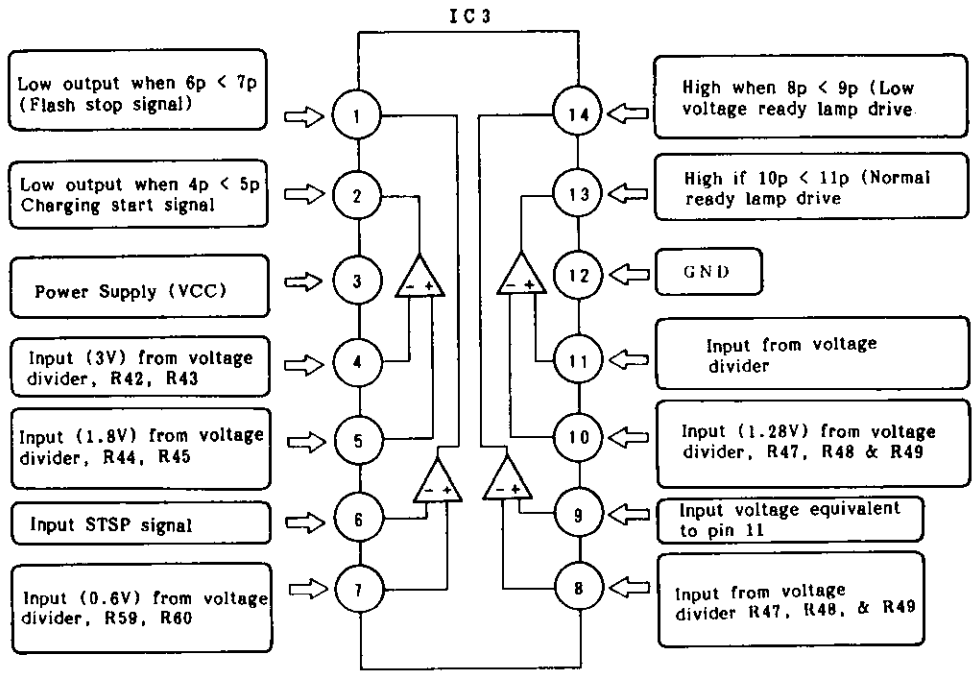


IC TERMINAL FUNCTION

Speedlite 160E uses 3 IC's, voltage regulator IC (IC1), and comparator ICs (IC2 and IC3).







ELECTRONIC CIRCUIT EXPLANATION

Power Supply Voltage	Speedlite 160E uses two power supplies. 1. Generated by battery VCC --- Battery Power Supply (6V) VDD --- Voltage Regulator (2.5V) 2. Generated by DC/DC convertor VHV --- Charging voltage for the main capacitor(350V)

1. VCC & VDD Generation As the Speedlite 160E has no main switch, VCC is generated with EFID signal or CCC signal from SW 1 of the camera body.

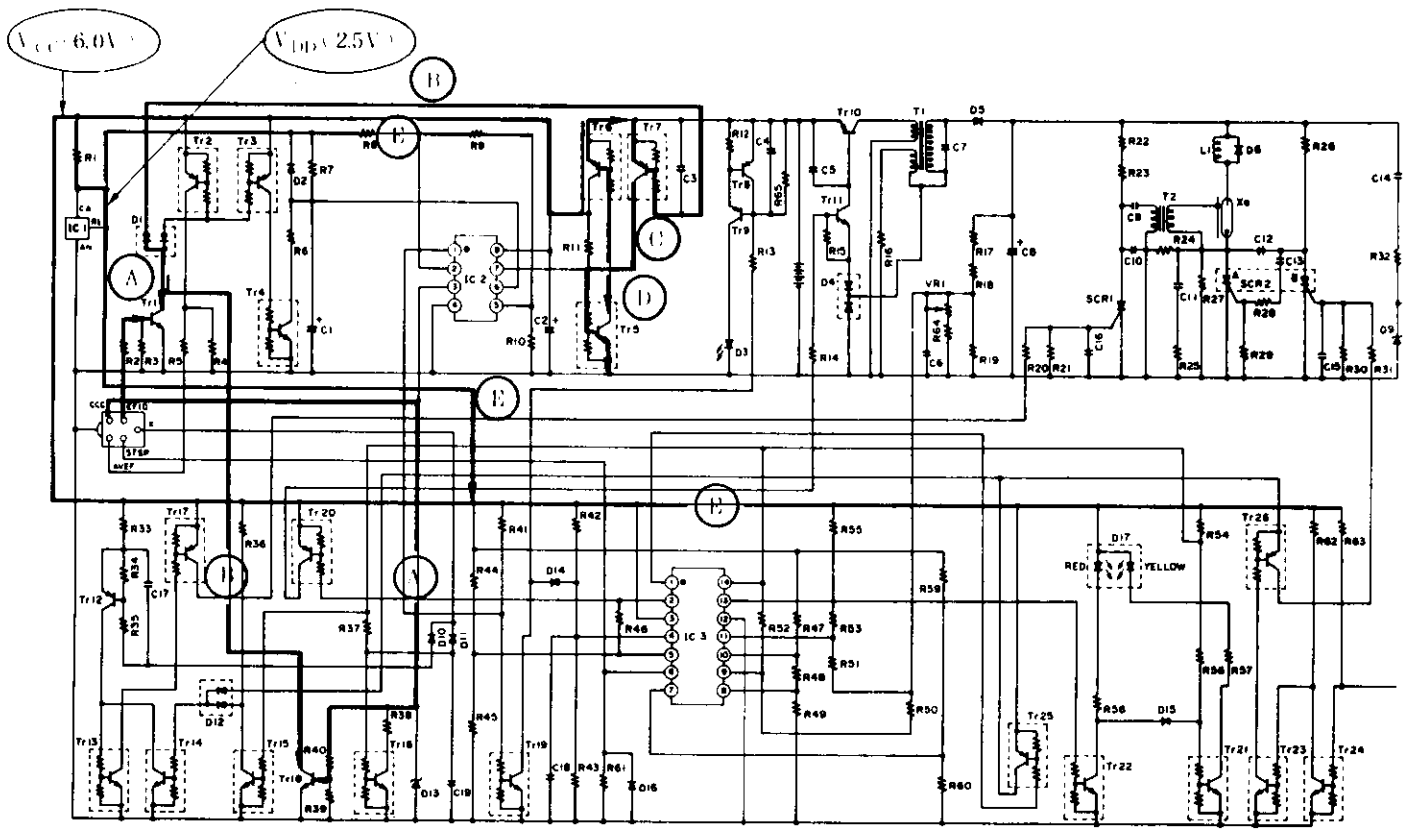
EFID (2.2V)
CCC (1.25V) ---> A. When metering switch (SW1) of the camera is turned on, "high" is output as EFID signal and CCC signal.

B. With this "high", Tr1 and Tr18 are turned on and then a current flows from power supply to Tr7 through D1.

C. With Tr7 turned on, "high" is input to the base of Tr5.

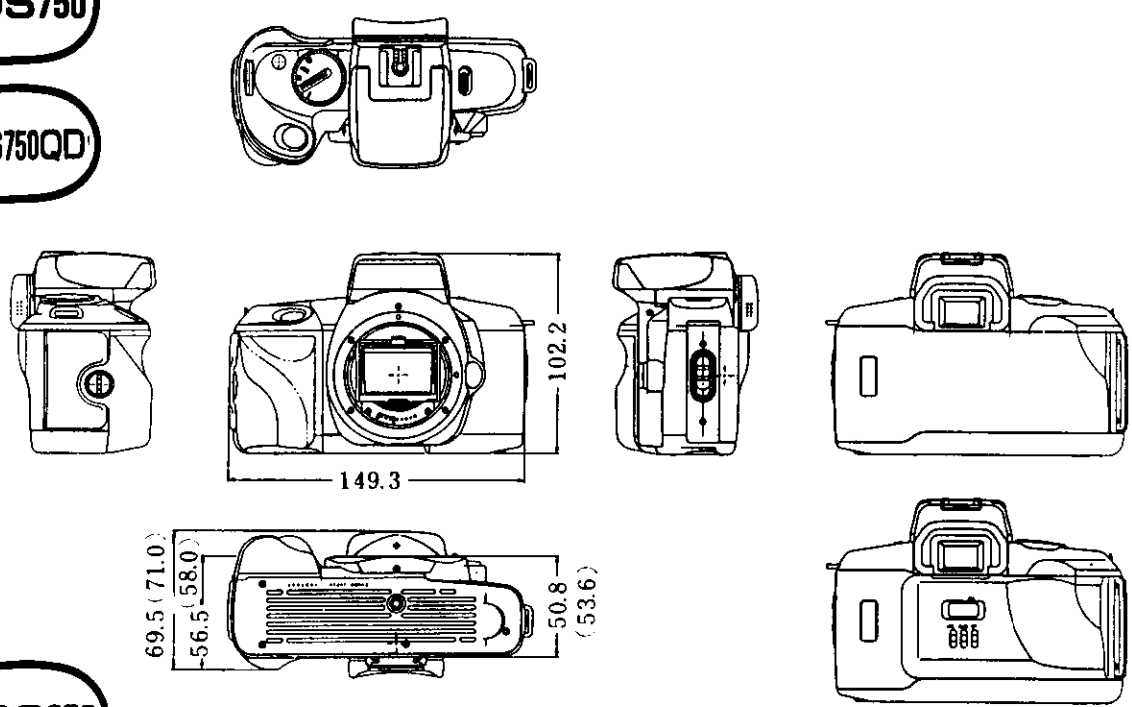
D. With Tr5 turned on, Tr6 is also turned on and VCC is generated. On turning Tr6 on, "high" is input to the base of Tr5, so VCC is generated continuously (for 8 seconds) without "high" from EFID signal.

E. VCC (6.0V) and VDD (2.5V) are supplied from voltage regulator of IC1 to each IC.



EOS750

EOS750QD



EOS850

Dimensions in ( ) are for EOS 750QD

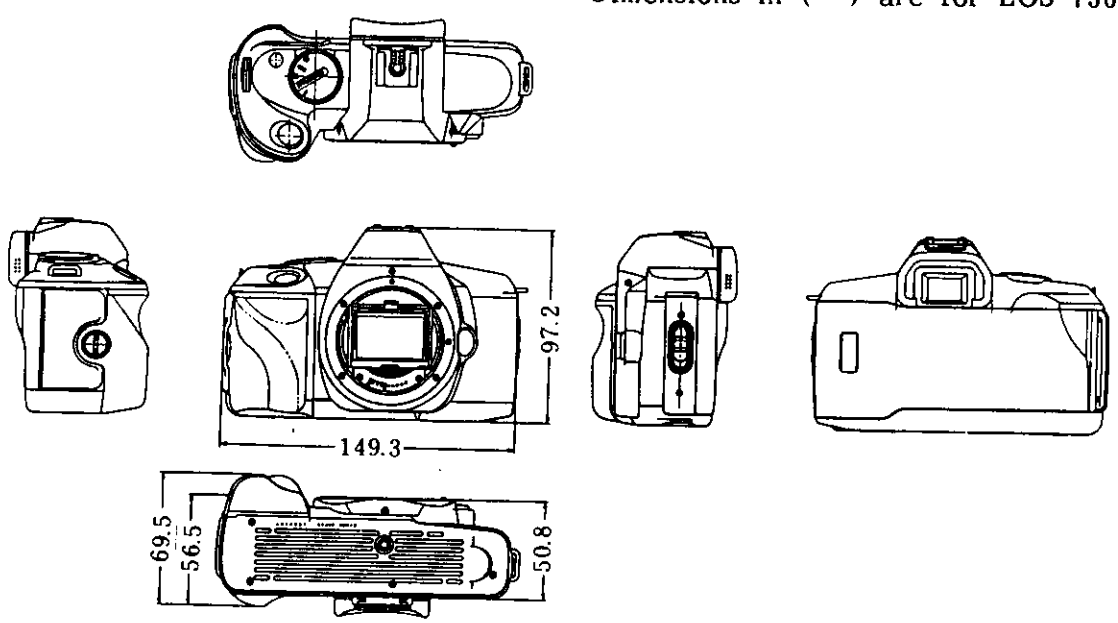
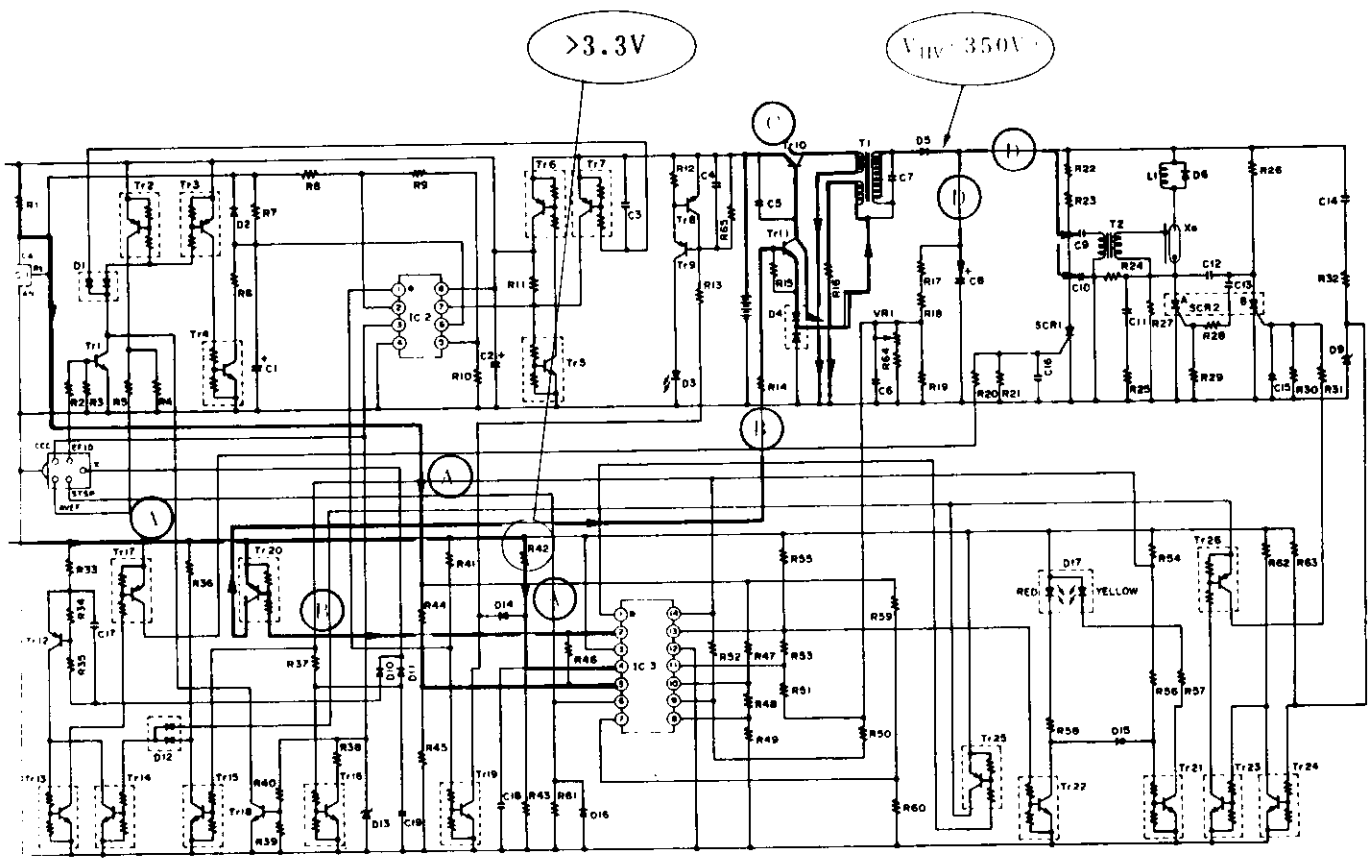


Fig. 3: External Appearance

2. Charging

A. With VCC generation, VCC is applied to pin 4 of IC3 and the regulated voltage (VDD) is applied to pin 5 of IC3. When the voltage of VCC exceeds 3.4V, "low" is output from pin 2 of IC3.
B. With this, Tr20 turns on, and "high" is input to the base of Tr11 causing Tr11 to turn on.
C. With Tr11 on, Tr10 turns on and current flows through the primary of T1 to start charging.
D. The high voltage induced in the secondary of T1 is applied to the main capacitors (C8) and the trigger circuit capacitors (C9, 10) through diodes D5.

During AF Illuminator Operation ---> When the VCC voltage drops below 3.3V, "high" is output from pin 2 of IC3 to interrupt the charging momentarily.



3. Ready Lamps

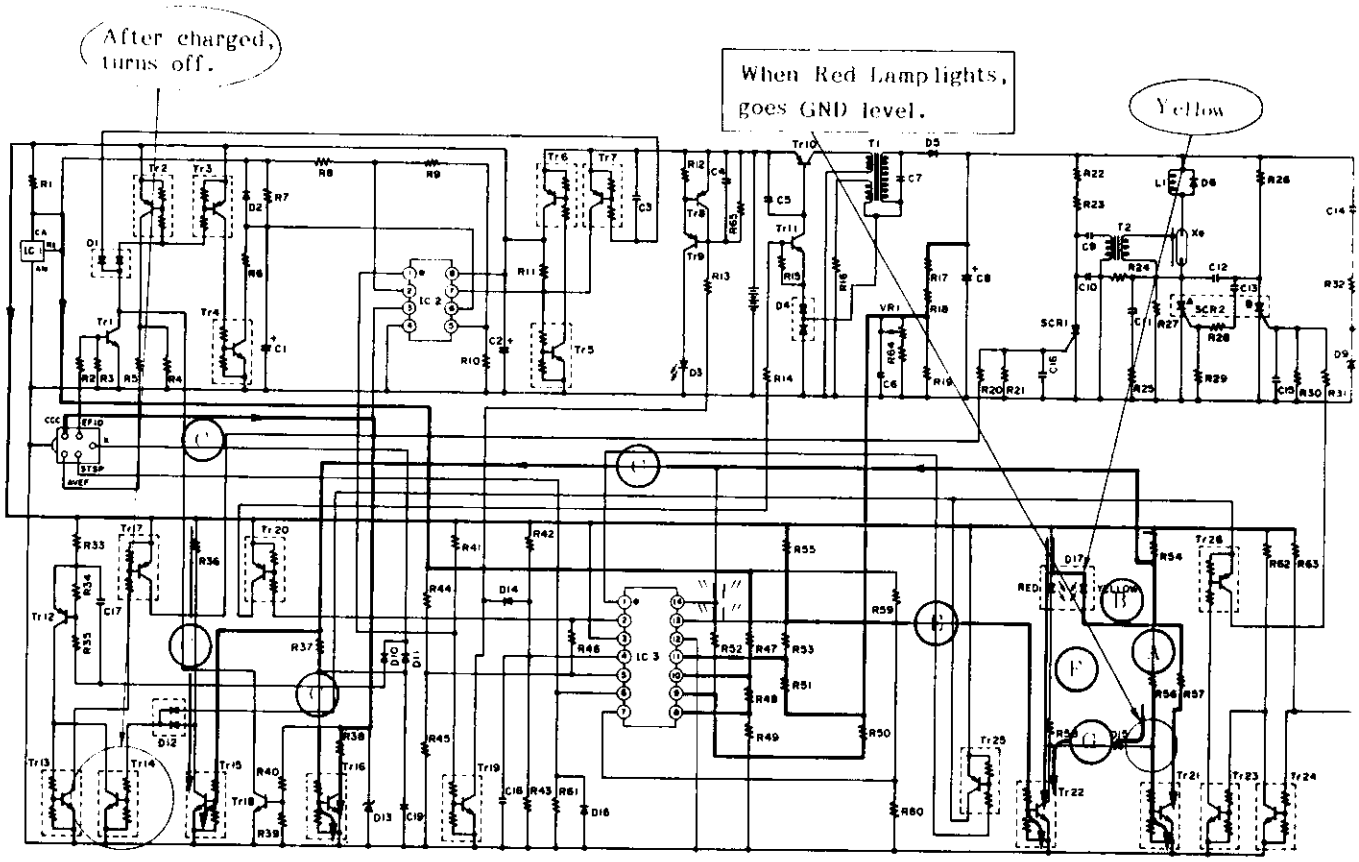
When the voltage on the capacitor reaches 190V, the yellow-green LED lights. When the voltage reaches about 250-253V, the red LED lights.

[Low voltage ready LED]

A. When the voltage reaches 190±5V, "high" is output from pin 14 of IC3. With this, "high" is input to the base of Tr21 causing Tr21 to turn on.
B. With Tr21 turned on, D17 (yellow-green) emits.
C. When "high" is input to pin 14 of IC3, Tr15 and Tr16 turn on. This pulls down about 250uA from CCC. With this current flow, the camera determines that the flash has charged.
D. With Tr15 on, the current stops flowing to the base of Tr14 and Tr14 turns off, canceling the flash inhibit condition.

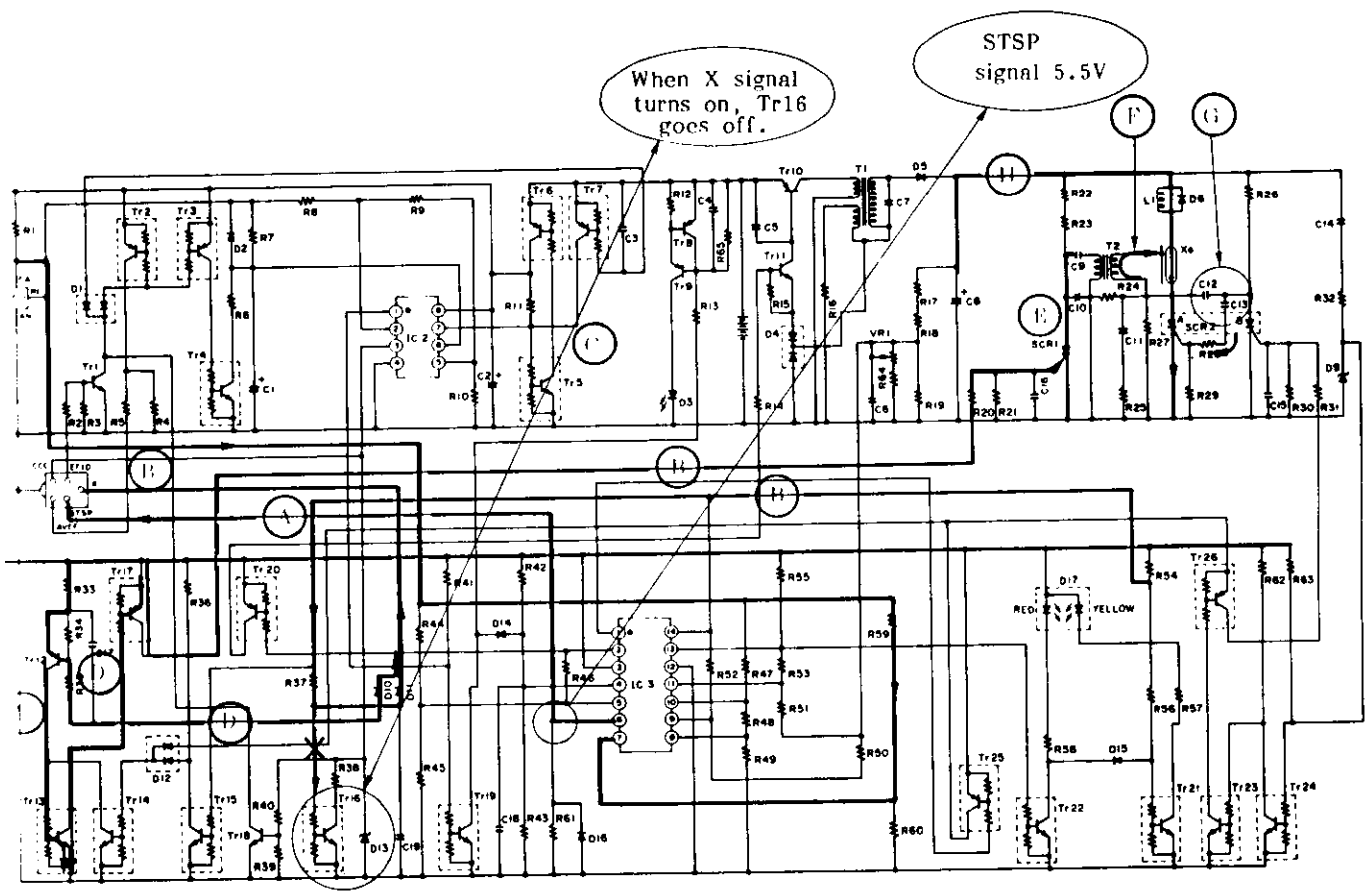
[Normal ready LED]

E. When the voltage reaches 250-253V, "high" is output from pin 13 of IC3. With this, "high" is input to the base of Tr22 through R55 causing Tr22 to turn on.
F. With Tr22 on, D17 (red) lights.
G. At this time, current which has been applied to Tr21 flows to the collector of Tr22 through diodes D15.
H. This causes Tr21 to turn off extinguishing the D17 yellow-green lamp.



4. Flash

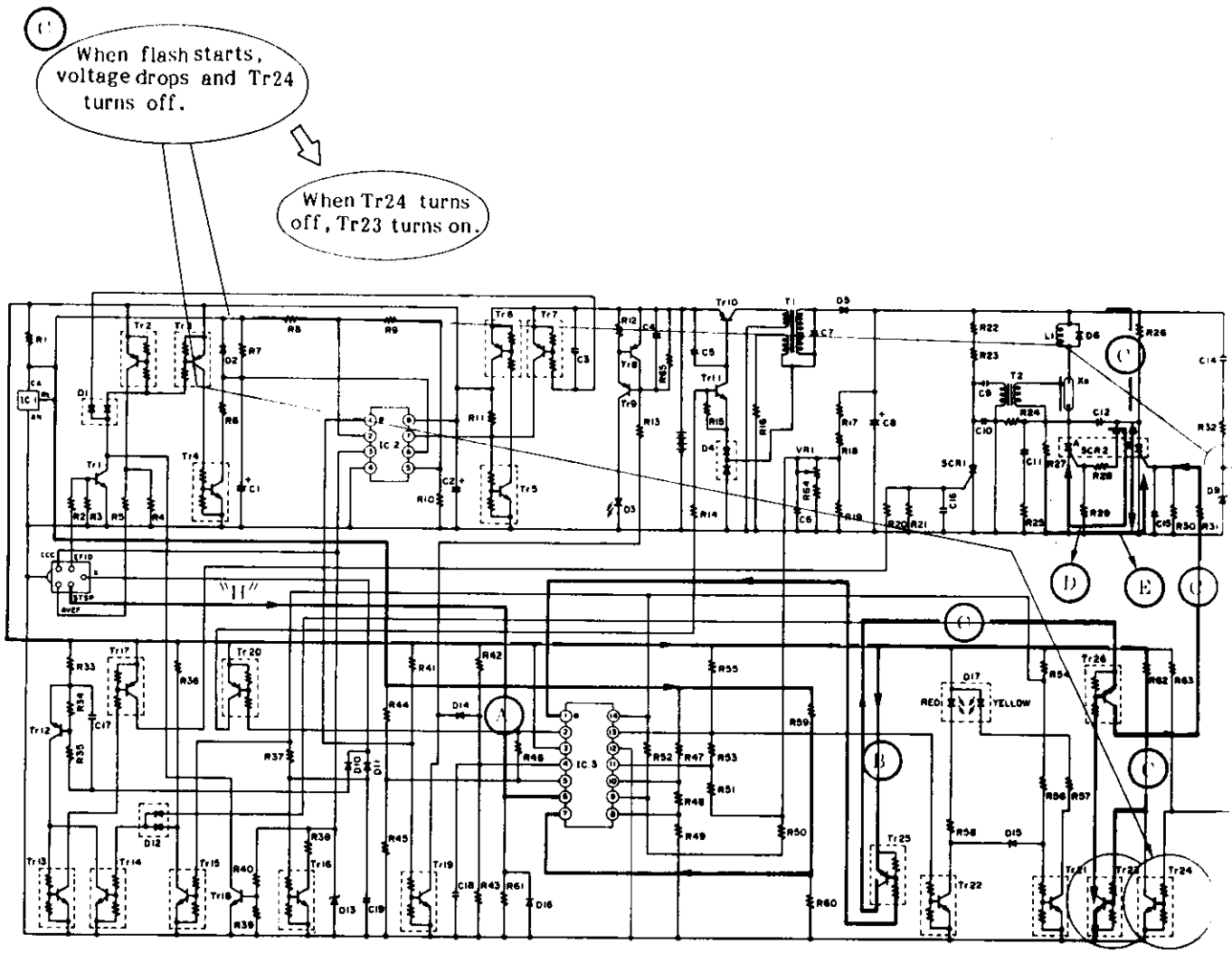
A. When the shutter is released after charging, STSP signal from the camera is applied to pin 6 of IC3.
B. When the first curtain completes its run, the X sync. signal is output. This pulls the current which have been flowed to the base of Tr16 down to X terminal through R37 and D11.
C. This causes Tr16 to turn off.
D. The X sync. signal turns Tr12 on through D10. With Tr12 on, Tr13 and Tr17 also turn on. With Tr17 turning on, "high" is applied to the gate of SCR1.
E. With SCR1 gated on, capacitor C9 and C10 begins to discharge through SCR1.
F. This induces a high voltage current in the secondary of T2, and a high voltage trigger pulse is applied to the flash tube.
G. Through C12 and C13, SCR2-A is gated on.
H. With this, the charge stored in C8 (main capacitor) discharges through L1 and the flash tube, and the main flash takes place.



5. Automatic Flash Termination

Automatic flash termination is controlled by the TTL SPC in the camera. Light reflected from the subject enters the SPC. When the camera judges the exposure as complete, STSP signal goes from "low" to "high". (Flash stop signal)

A. STSP signal turns from "low" to "high" to stop firing.
B. This "high" is applied to pin 6 of IC3 and "low" is output from pin 1. With this, the base of Tr25 goes "low" and Tr25 turns on.
C. This turns Tr26 on, and "high" is applied to the gate of SCR2-B, gating SCR2-B on.
D. With SCR2-B on, C12 and C13 are discharged and this induces a current reverse biasing SCR2-A, turning it off.
E. This causes C12 to be charged. With the flash terminated, C-2 discharges through R2 applying reverse bias to SCR2-B turning it off.



6. Energy-Saving (SE) Function

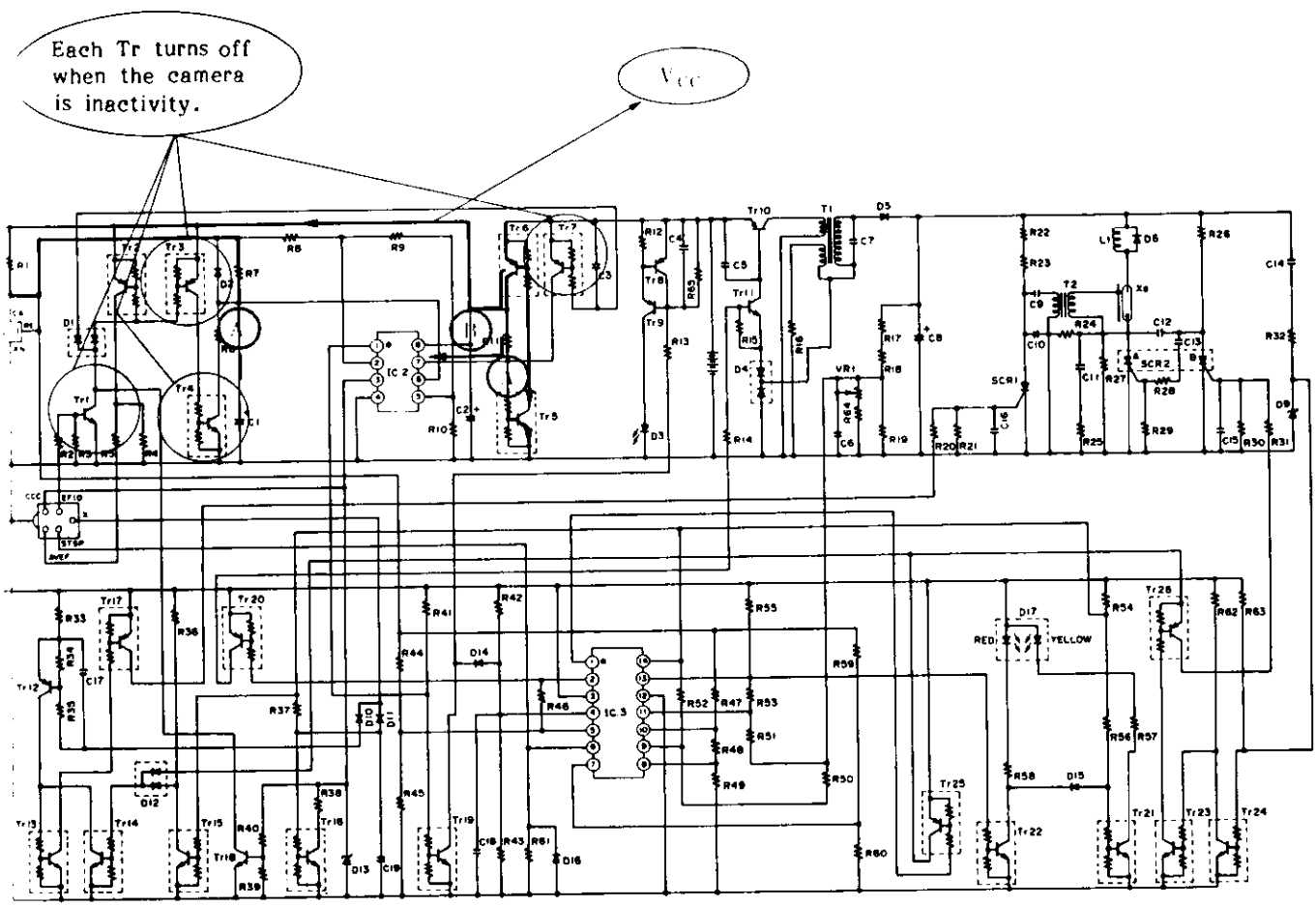
If the camera is inactive after photography, charging and other functions are stopped.

A. When no switch operation would be continued, Tr1 turns off. With this, Tr7 is also turned off; still VCC is generated continuously as the power hold circuit is acting.

B. With Tr1 turning off, Tr3 and Tr4 also turn off causing C1 to be charged. After 8 seconds, "low" is output from pin 7 of IC2 and the base current of Tr5 is pulled down to pin 7 of IC2. This causes Tr5 and Tr6 to turned off stopping VCC generation.

SE Function Reset

On pressing the SW1 on the camera, VCC and VDD are generated, With VCC generation, Tr3 and Tr4 turns on pulling down current to the collector of Tr4 through R7 and R6. Also C1 discharges through R6, Tr4. As the voltage of pin 6 of IC2 drops, the output from pin 7 of IC2 goes "high" to stabilize the VCC generation.



7. AF Illuminator Trigger

This cycles until ranging is over, or 5 cycles. ---> A. When SW1 is on, light is measured. If it is below a certain level, a "high" (above 3.2V) is sent from CCC to pin 3 of IC2.

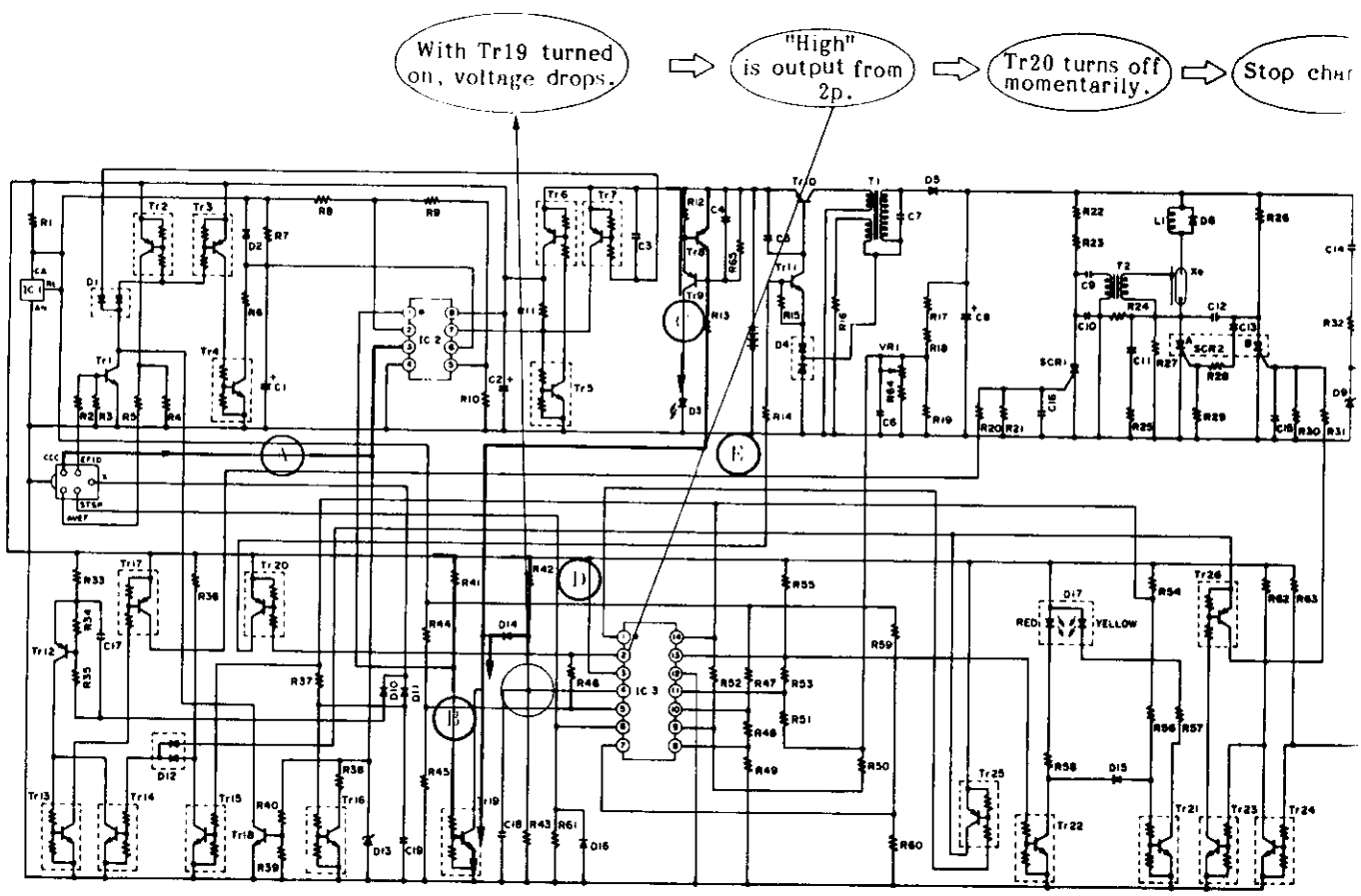
B. When IC2 receives this information, it sends a high pulse signal from pin 1 of IC2 to the base of Tr19 turning Tr19 on.

Tr8 and Tr9 is a current stabilizer for D3. ---> C. With this, Tr9 turns on, and current flows through D3, the AF illuminator, causing it to light for the duration. This causes Tr8 turning on to control the current flow.

[During AF illuminator flashing, the charging is interrupted.]

D. With Tr19 turning on, current is pulled down to the collector of Tr19 through D14. This causes the voltage of pin 4 of IC3 to drop down turning the output of pin 2 from "low" to "high".

E. This causes Tr20 to turn off, and also Tr11 and Tr10 turn off. With this, charging is interrupted.



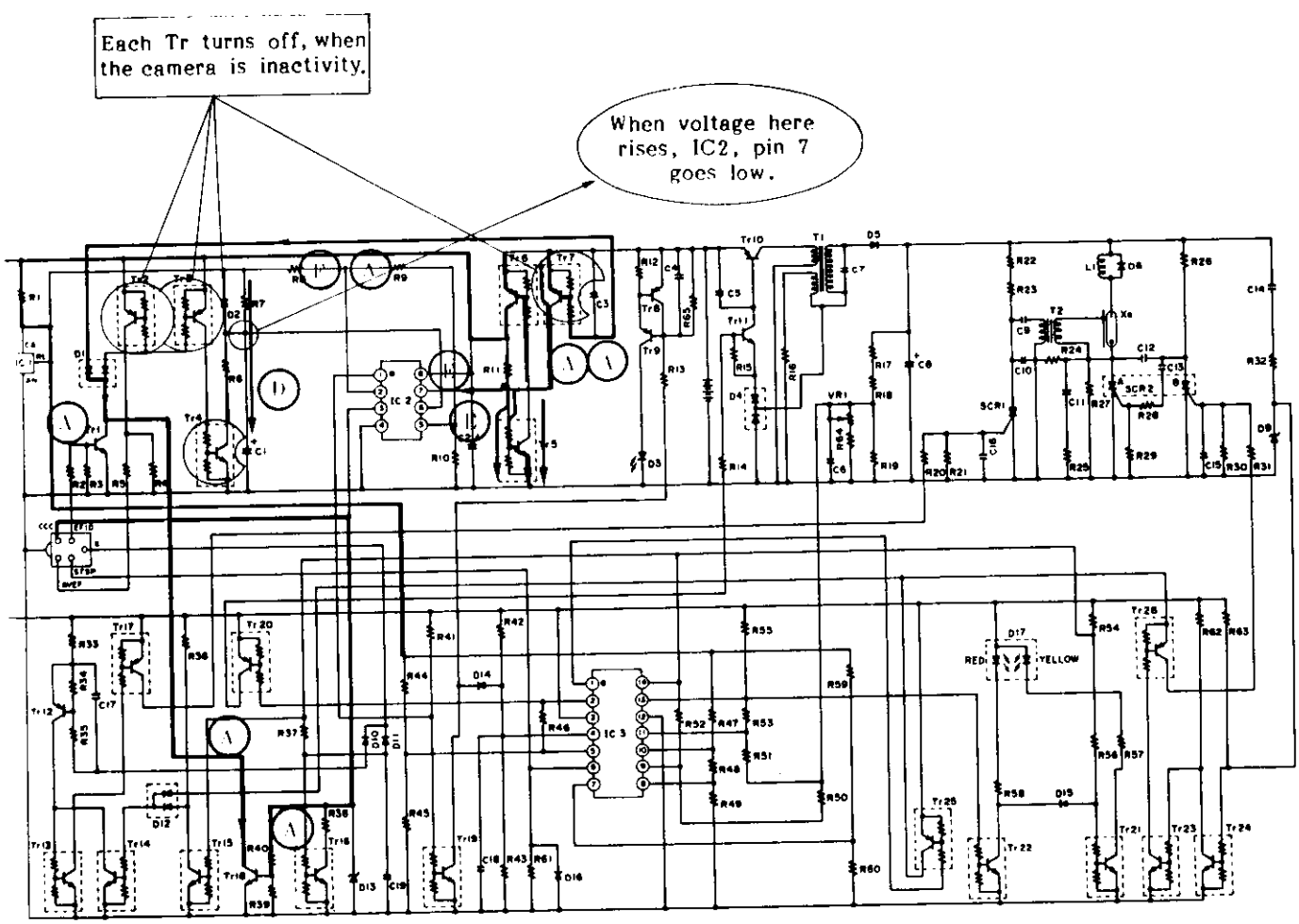
8. Power Hold Circuit

A. When the main switch (SW1) of the camera is turned on, VCC and VDD are generated.
B. Once VCC is generated, it continued for 8 seconds. After 8 seconds, the internal timer causes Tr1 and Tr18 to turn off and SE function starts to operate.
C. With Tr1 and Tr18 turned off, Tr2, Tr3, Tr4 and Tr7 is also turned off.
D. This causes the capacitor C1 to be charged. (SE timer starts)
E. The current which flows to the base of Tr5 through Tr7 is changed to flow through Tr6.
F. VCC is generated. After 8 seconds, pin 7 ---> of IC2 goes "low" pulling down the current of Tr5 to pin 7 of IC2.
G. Tr6 turns off and stop VCC generation.

When the voltage of C1 goes up, "L" is output from IC2, pin 7

If EFID or CCC signal is applied during the 8 seconds interval, the cycle [A] through [G] is repeated.

These transistor turn off when the camera is deactivated



CHECKPOINT DIAGRAMS

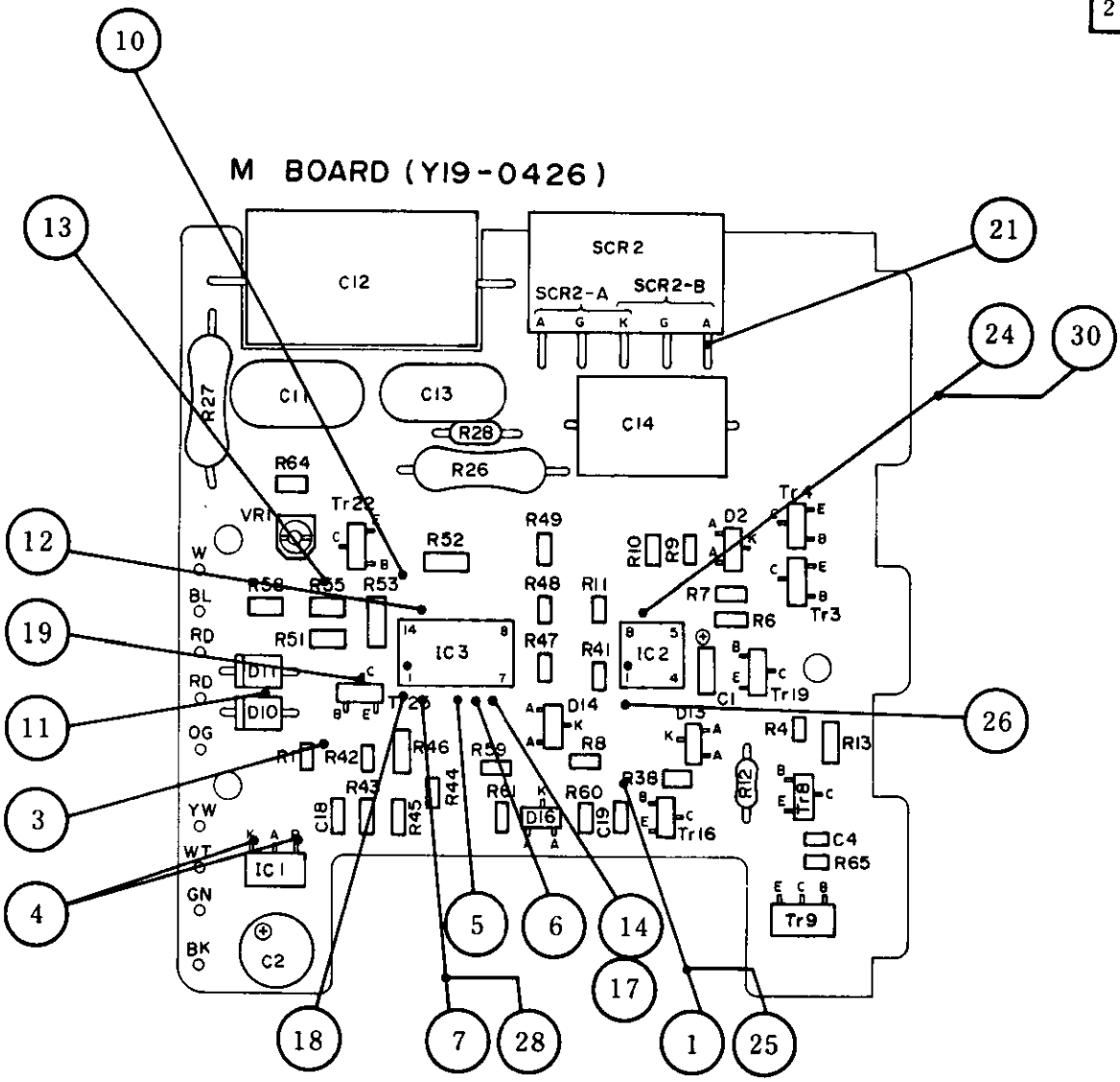
These Checkpoint Diagrams are used with the electronic Circuit Information, in the same way as Speedlite 420EZ. Each Diagram has a table indication the section and checkpoint in the circuit information, the call-out number, and element to be checked. The following example will explain how the circuit information and checkpoint diagrams are used.

EXAMPLE: You wish to check section 7, AF illuminator trigger.

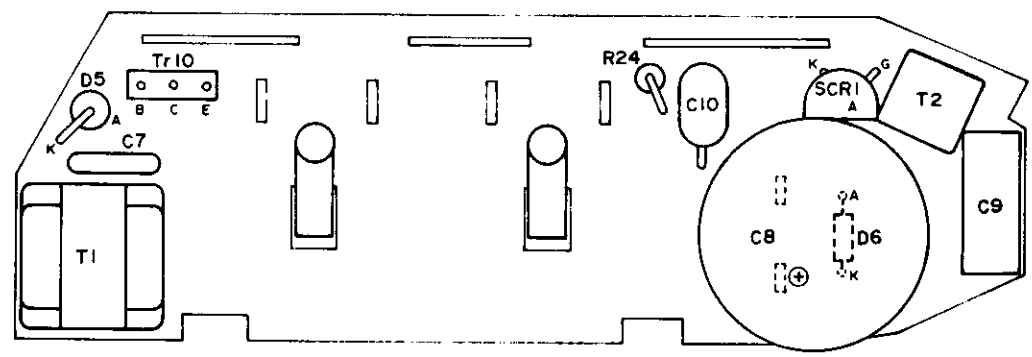
1. Carefully read through section 7 from [A] to [E].
2. Determine which of the checkpoint [A] through [E] that you wish to check.
3. For example, you wish to check [B] to see if pin 1 of IC2 is "high" as it should be.
4. Look through the checkpoint tables to find point 7 [B].
5. In this case, 7 [B] is on the call-out number's 26. Find number 26 on the diagram. This is the test point for 7 [B].
6. The correct signal at this point is a "high".
7. From the results of this check, you will know whether it is necessary to go back, or forward, in the circuit to find the point of the trouble.

Sect
1 -
1 -
1 - 1
1 -
2 -
2 -

M BOARD (YI9-0426)

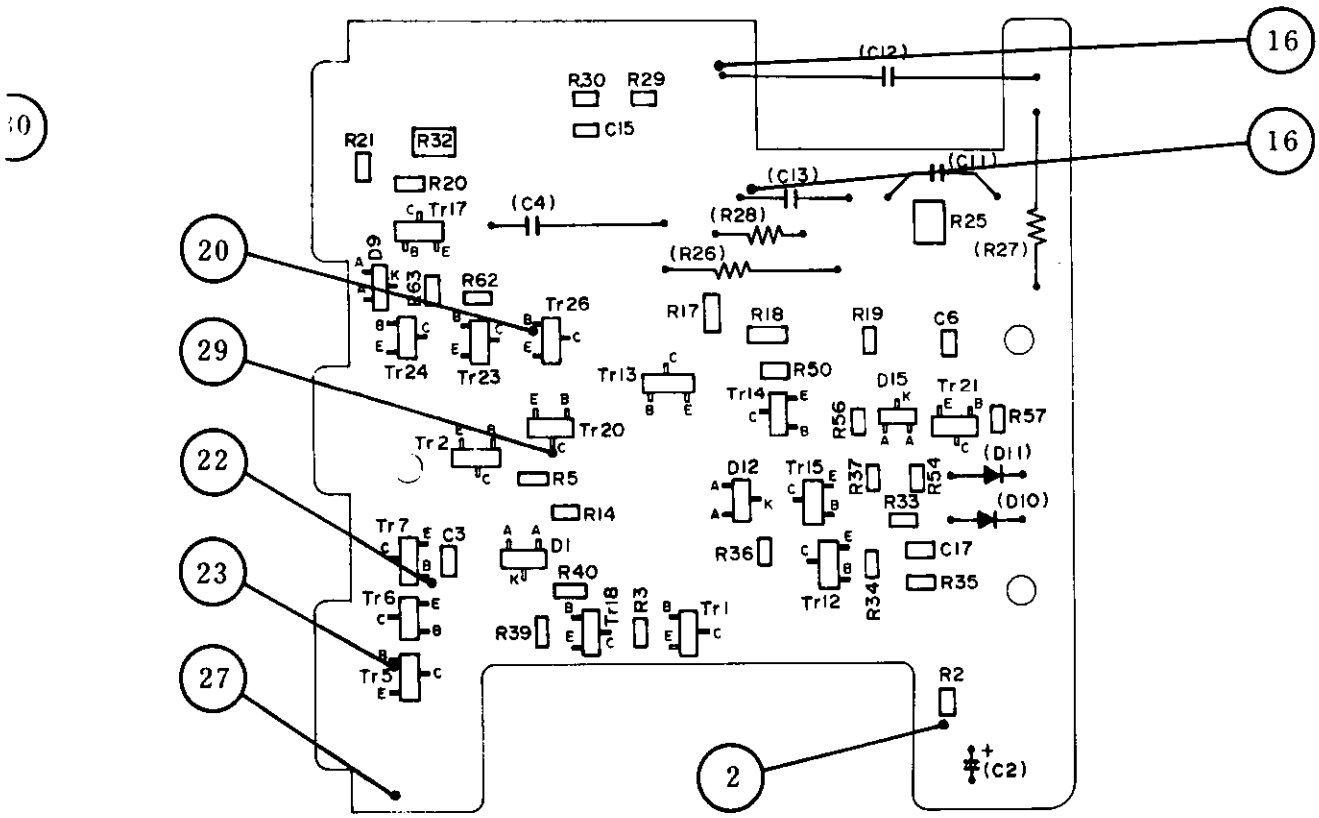


BC BOARD (YI9-0427)



( ) Reverse Side

Section	No.	Checkpoint	Section	No.	Checkpoint	Section	No.	Checkpoint	Section	No.	Checkpoint	Section	No.	Checkpoint
1 -Ⓐ	1	IC2-3P (CCC Signal)	2 -Ⓐ	⑦	IC3-2P	3 -Ⓖ	⑬	D15-K	5 -Ⓒ	⑲	Tr25-C	7 -Ⓐ	25	IC2-3P
1 -Ⓐ	2	R2 (EFID signal)	2 -Ⓒ	⑧	D5-K (V_{HV})	4 -Ⓐ	⑭	IC3-6P (STSP signal)	5 -Ⓒ	⑳	Tr26-B	7 -Ⓑ	26	IC2-1P
1 -Ⓓ	3	C2(+) (V_{CC})	2 -Ⓓ	⑨	C8(+), C9, 10	4 -Ⓓ	⑮	SCR1-G	5 -Ⓒ	㉑	SCR2 B A	7 -Ⓒ	27	D3 -A
1 -Ⓔ	4	IC1-RK (V_{DD})	3 -Ⓐ	⑩	IC3-14P	4 -Ⓖ	⑯	C12, C13	6 -Ⓐ	㉒	Tr7-B	7 -Ⓓ	28	IC3-2P
2 -Ⓐ	5	IC3-4P	3 -Ⓑ	⑪	D17-A	5 -Ⓑ	⑰	IC3-6P (STSP signal)	6 -Ⓑ	㉓	Tr5-B	7 -Ⓔ	29	Tr20-C
2 -Ⓐ	6	IC3-5P	3 -Ⓔ	⑫	IC3-13P	5 -Ⓑ	⑱	IC3 1P	6 -Ⓑ	㉔	IC2-7P	8 -Ⓕ	30	IC2-7P



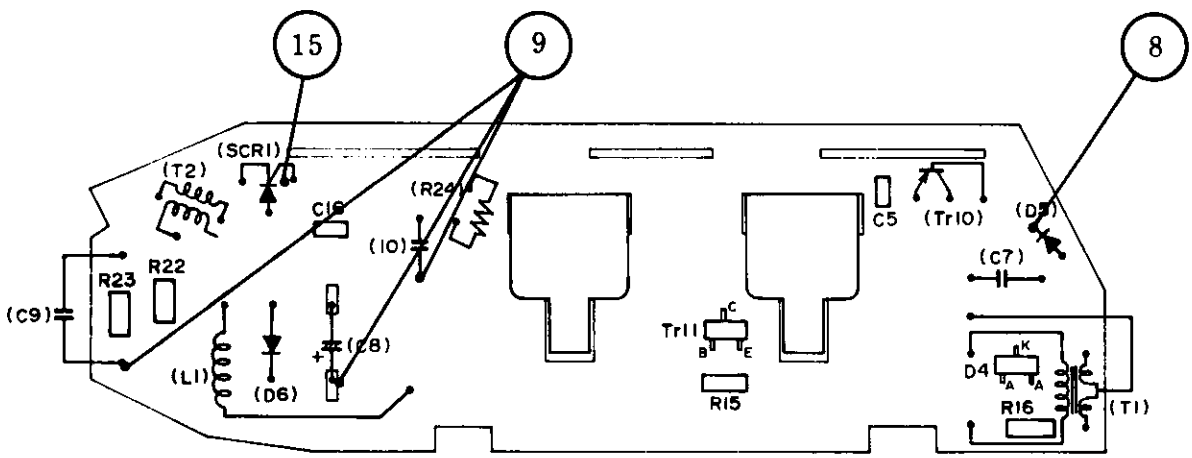
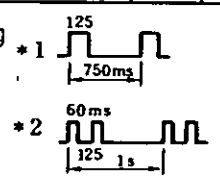


Table-2 Viewfinder Information and Beeper Tone Variations

	Viewfinder information display						Beeper tone						Action (note)
	lights	blinks											
		2Hz	4Hz	8Hz	irregular	off	pipi	pipo	pipo pipo	2Hz	8Hz	no signal	
AF in-focus	●						●						
AF focusing impossible				☼								●	Turn to the subject with higher contrast or switch to manual focus mode.
Depth -1					☼ *1			●					
Depth -2					☼ *2				●				
Depth -3 (OK within the depth)	●						●						
Out of depth of field zone							●						Set to shorter focal length or make the depth of field zone smaller (shutter works with minimum aperture value).
Correct AE												●	
Camera shake warning												●	Use a tripod or flash
Flash charge complete												●	
Flash charge incomplete												●	Wait until charging completion (with 160 EZ, release is locked).
Out of coupling range warning												●	Use ND filter or a flash.
Out of flash coupling range warning												●	(this displays only when using the 420 EZ or 300 EZ)
Battery check, OK											●		
Replace battery warning										●			Have a new battery handy
Battery exhausted												●	Replace with a new battery
Self-timer										●	●		(2Hz: 8 sec., 8Hz: 2 sec.)
Automatic-loading failure											●		Reload the film. (warning for max. 4 sec., release is locked).

Irregular blinking



REPAIR INSTRUCTIONS

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BATTERY CONTACT REMOVAL TOOL	3-1
DISASSEMBLY	3-2
READY LAMP VOLTAGE ADJUSTMENT	3-4
TROUBLESHOOTING	3-5
ELECTRICAL DIAGRAMS	3-8

BATTERY CONTACT REMOVAL TOOL
(for local fabrication)

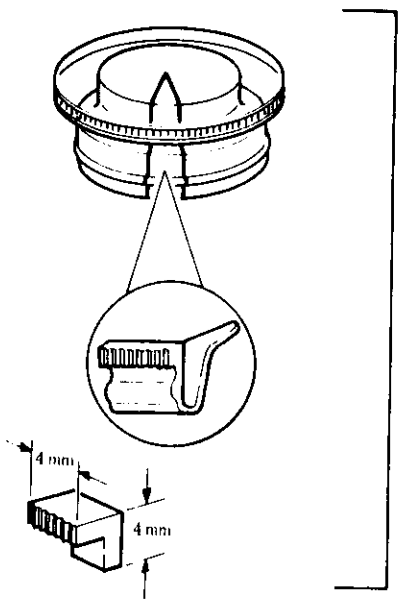
Purpose

The battery contact removal is the most troublesome part of disassembly of the Speedlite 160E. The following kludge can be made with the parts for the EOS dummy battery adapter and enables the technician to remove the battery contacts easily. It is not essential, but it is certainly a time-saving device if many 160E's are repaired.

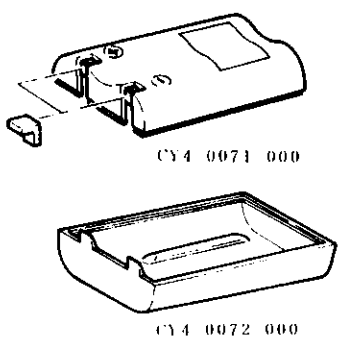
Parts List

Upper and lower cases of the EOS dummy battery adapter (or a dead 2CR5 battery) Instant bond
One cap from a Japanese type film can, or other suitable plastic.

Instructions



Cut two segments from the film can cap as shown. If a suitable film can is not available in your area, any piece of fairly hard plastic can be used by cutting to the shape shown.

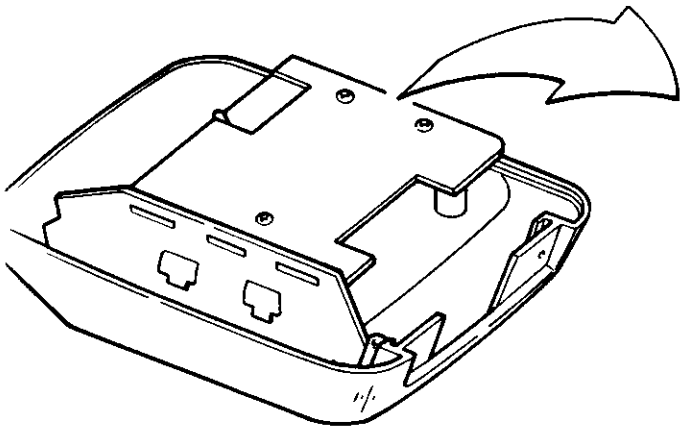


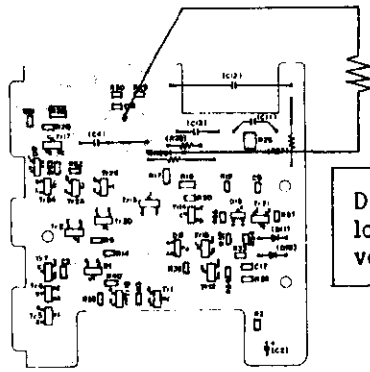
Attach the two pieces in place of the battery contacts and bond in place.

(By inserting this toll instead of the battery at the proper time during disassembly, the contacts pop right out. Without the tool, removing the contacts usually requires three hands with six fingers each).

DISASSEMBLY

CAUTION! Always discharge the capacitor before starting any disassembly.



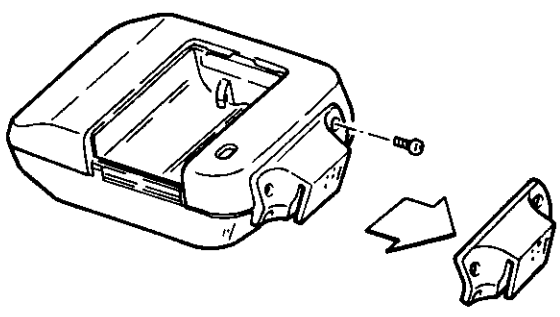


Discharge through a low resistance, high voltage resistor.

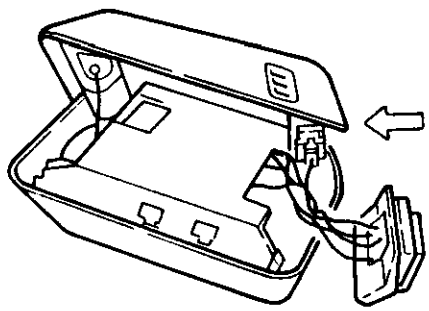
Disassembly Procedure

1. Shoe Unit Disassembly

1



Shoe Unit



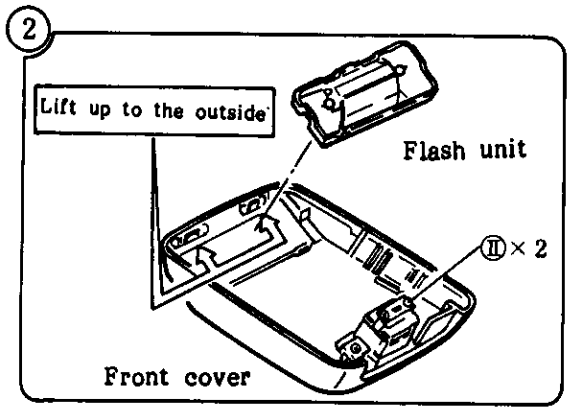
Remove the front cover.

Remove the front cover.

Remove the four screws (I), and the front cover can be removed.

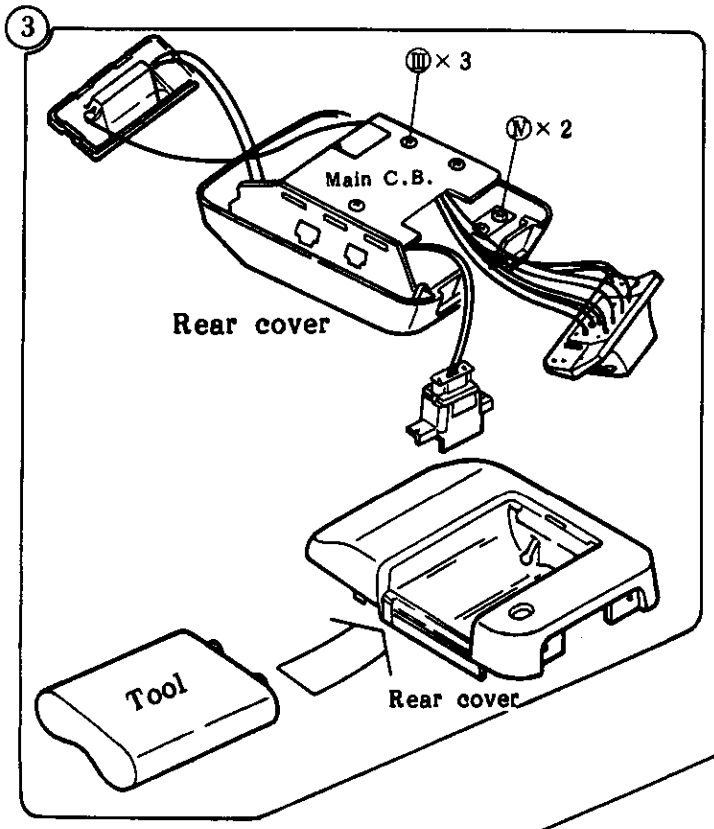
DISASSEMBLY PROCEDURE

2. Flash unit, AF illuminator unit disassembly



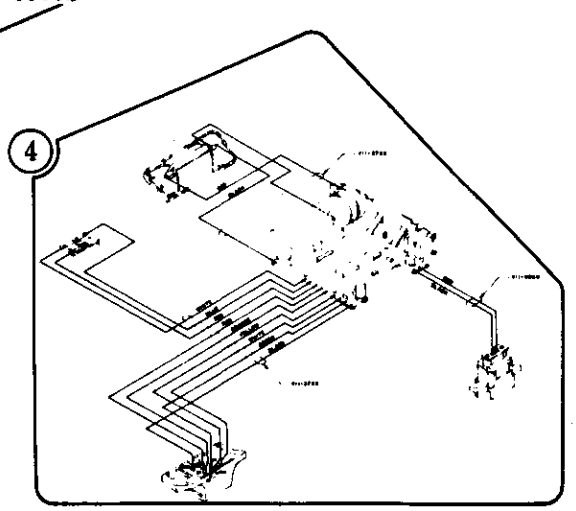
1) Lift up the clips of the front cover and remove the flash unit.
2) Remove the two screws (II) and remove the AF illuminator unit.
3) After removing the Flash unit and AF illuminator unit, the front cover unit can be replaced.

3. M, B and PL Circuit Board disassembly



1) Remove the three screws (III) from M C.B. and two screws (IV) from PL C.B.
2) M and B C.B. can be removed from the rear cover by inserting the battery kludge into in the battery chamber.

4. Wiring Diagram



READY LAMP VOLTAGE (Red LED) ADJUSTMENT

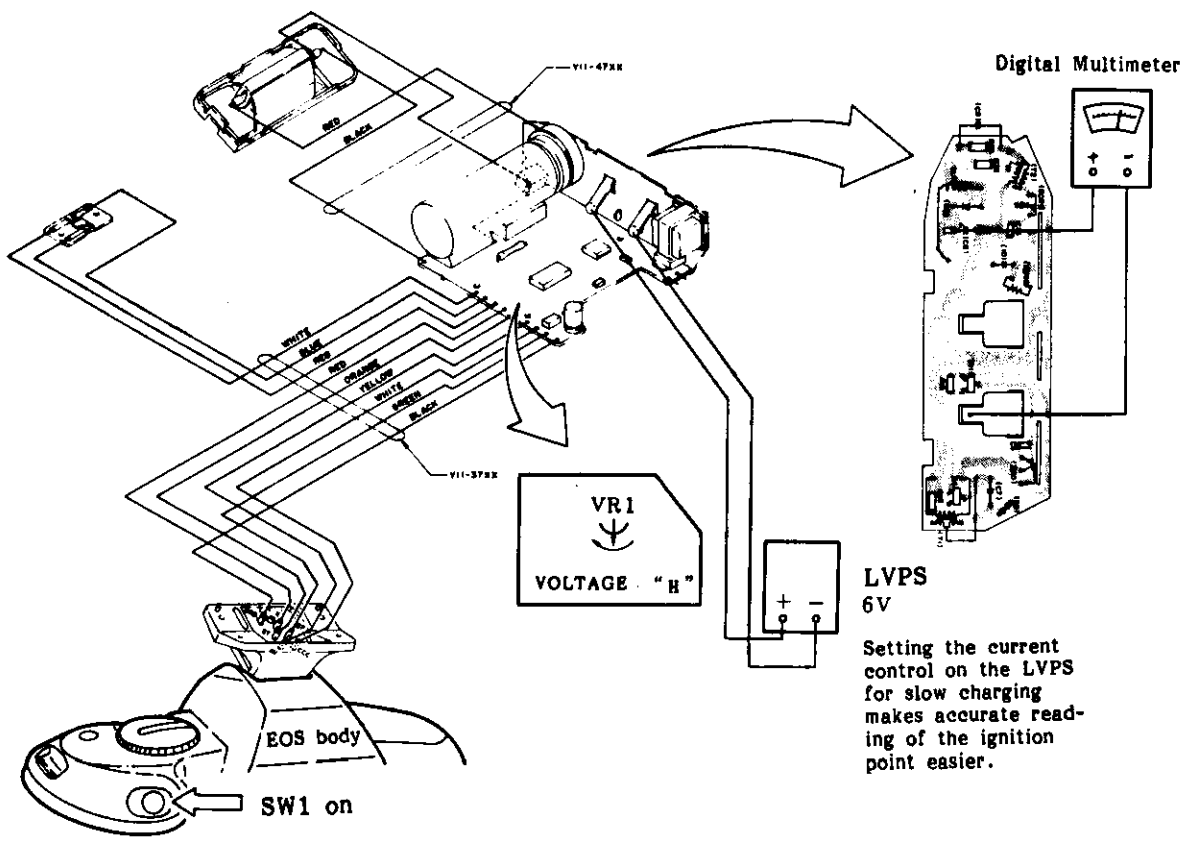
Standard: Ignites at 250-253V.

CAUTION!: 1. Always discharge the main capacitor before commencing adjustment.
2. As the Speedlite 160E has no main switch, VCC is generated by turning on SW1 of the camera. During adjustment, SW1 of the camera must be kept pushed, or SE function starts to operate and charging is stopped.

Adjusting Tools:

1. Regulated low voltage power supply (LVPS)
2. Digital Multimeter (DMM)
3. Shop-standard EOS body

Adjustment



TROUBLESHOOTING

You can troubleshoot by going through the operational flow. The following example will explain how this troubleshooting method is used.

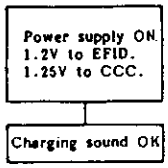
EXAMPLE: You wish to check section 6, Energy-saving (SE) function.

1. Carefully read through section 6, Energy-saving (SE) function.

2. When SE doesn't operate, measure the output voltage of pin 7 of IC2 on imputing 200V to pin 6 of IC2 according to this troubleshooting charts.

3. If the output voltage doesn't reach 5.2V, check each element listed on this troubleshooting charts "Action".

4. When the result of this check shows that IC2 is bad, replace IC2 as indicated on the "Action". All the elements listed on "Action" are set up as individual parts.



Charging sound OK → NO

Checkpoint	Indication		Checkpoint	Action
Use LVPS	Ammeter doesn't move	(1)	Check Tr6 M and B C.B. contact poor soldering. Check shoe wiring	Replace Main C.B.
	Ammeter moves slightly	(2)	T1 open line Tr10, Tr11 open D4 bad	Replace T1, Tr10
			Check Tr20 IC3 pin 2 poor soldering	Replace Battery C.B.

YES

Ready Lamp lights → NO

No lights	Read main capacitor voltage	0V	(3)	SCR2 open, D5 bad	Replace SCR2 Replace Battery C.B. unit
		180V	(4)	C8 shorted, leaky	Replace Battery C.B. unit
				SCR2 shorted, C12 shorted, leaky	Replace SCR2 Replace Main C.B.
		250V	(5)	Check lead wire of PL C.B. Check Tr22 IC3, pin 13 poor soldering	Replace Main C.B.
Lights very slowly	Check Ready Lamp ignition voltage	At 250V, RED doesn't light	(6)	VR1 poor adjustment IC3, pin 13 poor soldering	Replace Main C.B.

YES

Flash OK → NO

Momentary short SCR1 anode - cathode	Main flash OK	(7)	Flash tube bad SCR2 bad	Replace Flash tube Replace SCR2
			T2 bad C9 bad	Replace T2 Replace Battery C.B.
	No main flash	(8)	SCR1 bad	Replace SCR1
			Check Tr12, Tr13, Tr15 and Tr17	Replace Main C.B.

YES

AF Termination OK → NO

Check SCR2 operation	Doesn't operate	(9)	SCR2 open	Replace SCR2
			Check IC3, pin 1 output voltage	Replace IC3
			Check if IC3, pin 1 is "L" on applying 2.0V STSP signal.	Replace main C.B.
	operates	(10)	SCR2 shorted	Replace SCR2
			C12 and C13 bad	Replace main C.B.

YES

SE operation OK → NO

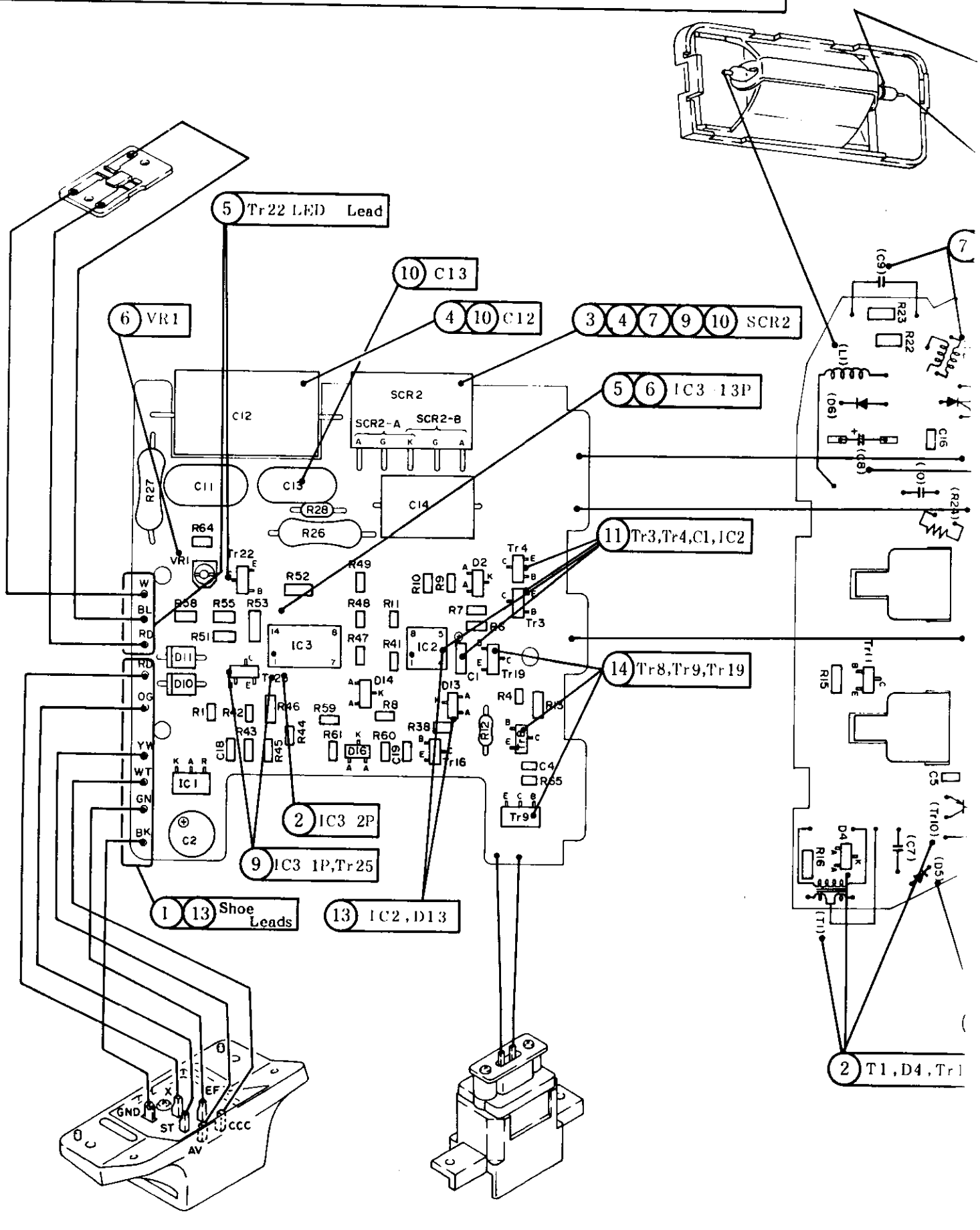
Measure the voltage of IC2, pin 17 on applying 2.0V to IC2, pin 6.	Somewhat under 5.2V	(11)	C1, IC2 bad Check Tr3 and Tr4.	Replace IC2 Replace Main C.B.
	Over 5.2V	(12)	Tr5, Tr6 bad	Replace Main C.B.

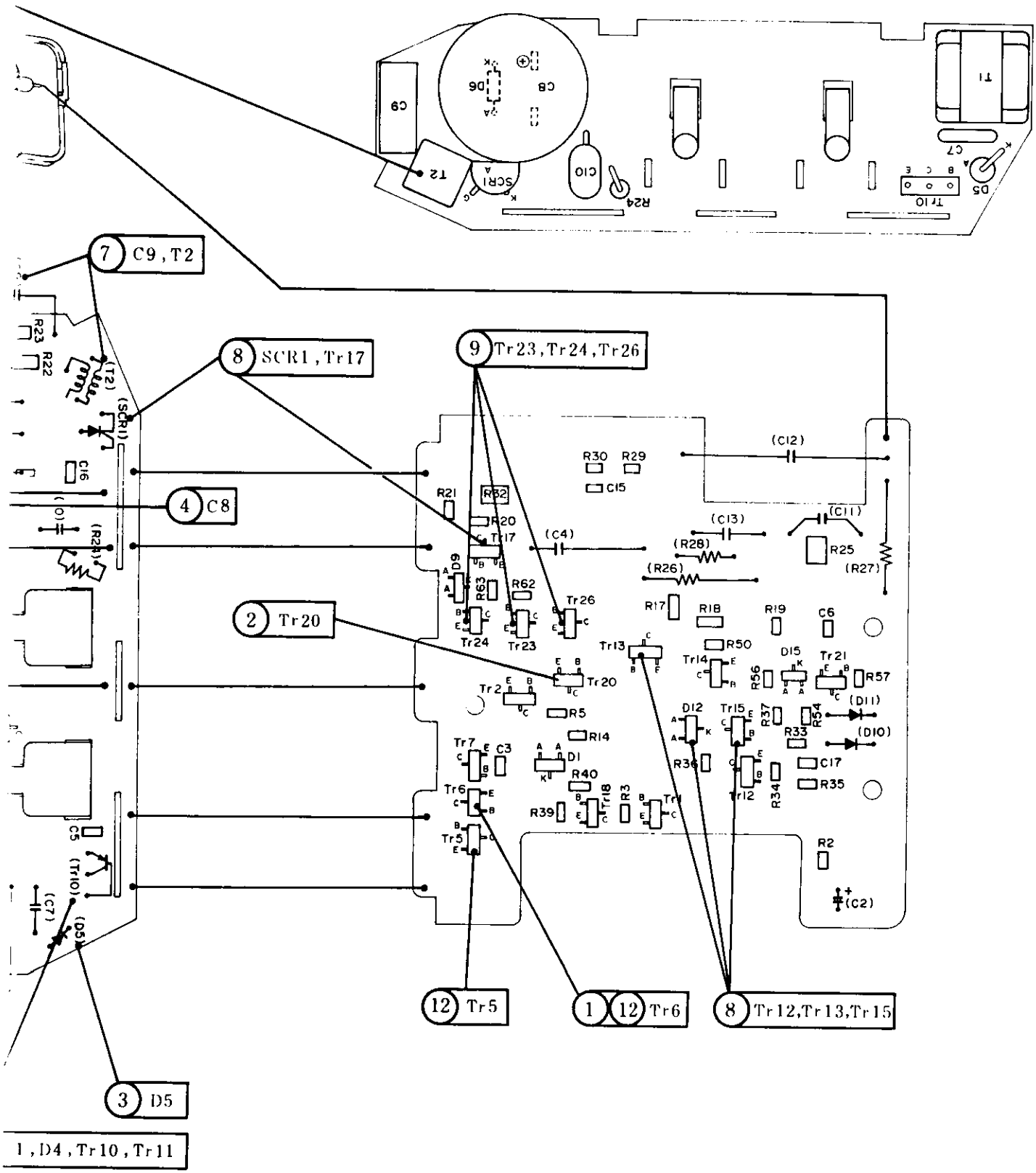
YES

AF Illuminator trigger OK → NO

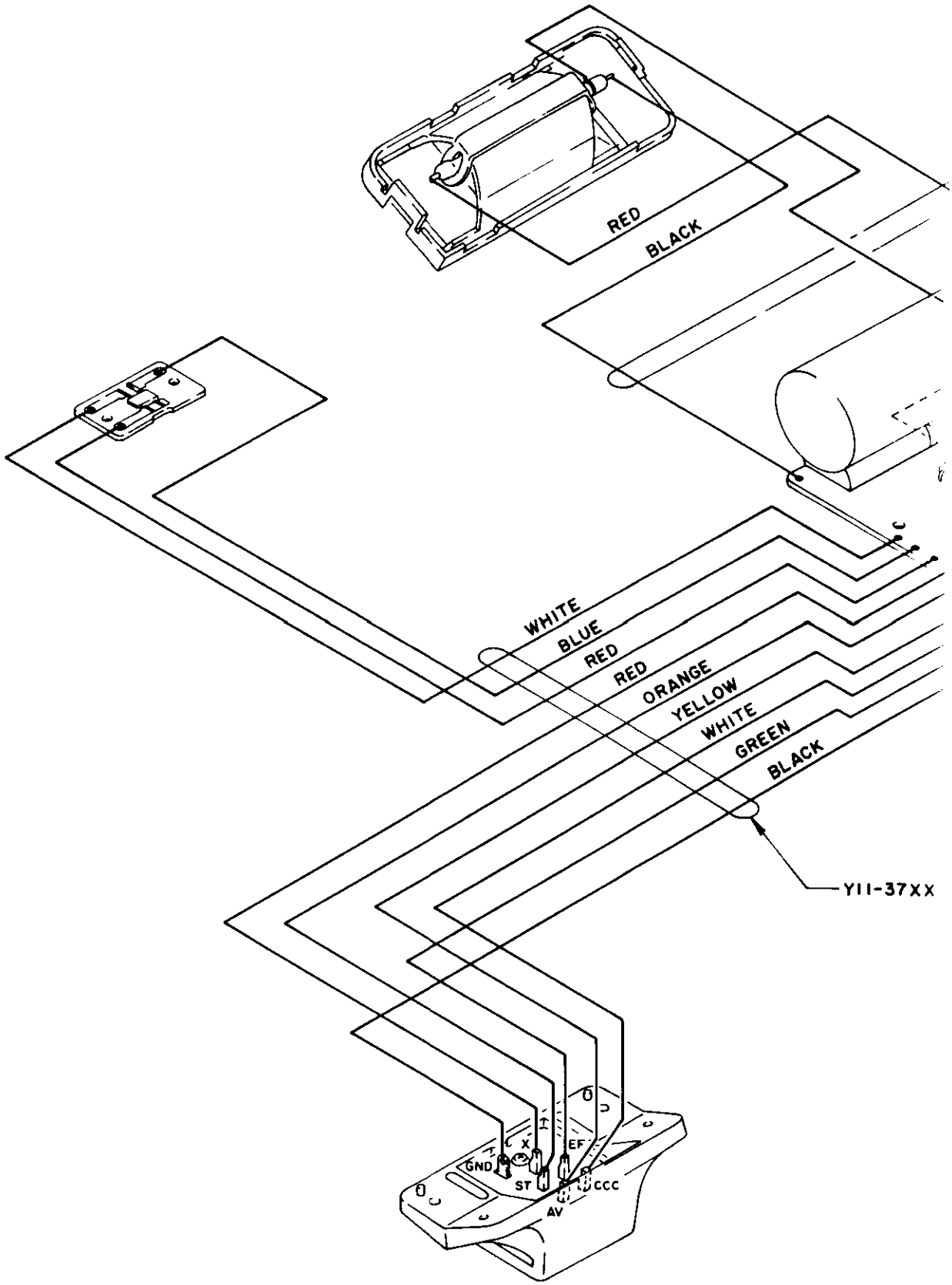
Measure the voltage of IC2, pin 1 on applying 3.5V signal.	Somewhat under 5.2V	(13)	Check Shoe wiring D13 shorted IC2 bad	Replace IC2 Replace D13 Replace Main C.B.
	Over 5.2V	(14)	Tr8 shorted Tr9 open Tr19 bad	Replace Main C.B.

CHECKPOINT


5 Tr22 LED Lead
10 C13
6 VR1
4 10 C12
3 4 7 9 10 SCR2
5 6 IC3 13P
11 Tr3,Tr4,C1,IC2
14 Tr8,Tr9,Tr19
2 IC3 2P
9 IC3 1P,Tr25
1 13 Shoe Leads
13 IC2,D13
2 T1,D4,Tr1
SCR2
SCR2-A
SCR2-B
C12
C11
C13
C14
R26
R28
R27
VR1
Tr22
IC3
IC2
IC1
C2
Tr19
Tr3
Tr4
Tr9
Tr16
D13
D14
D16
D11
D10
W
BL
RD
OG
YW
WT
GN
BK
GND
ST
CCC
AV
EF
7
(C9)
R23
R22
(L1)
(D6)
C16
(C8)
(D)
(R24)
Tr11
R15
C5
(T10)
D4
R16
(C7)
(D5)
(T1)


7 C9 , T2
8 SCR1 , Tr17
9 Tr23 , Tr24 , Tr26
4 C8
2 Tr20
12 Tr5
1 12 Tr6
8 Tr12 , Tr13 , Tr15
3 D5
1 , D4 , Tr10 , Tr11

WIRING DIAGRAM



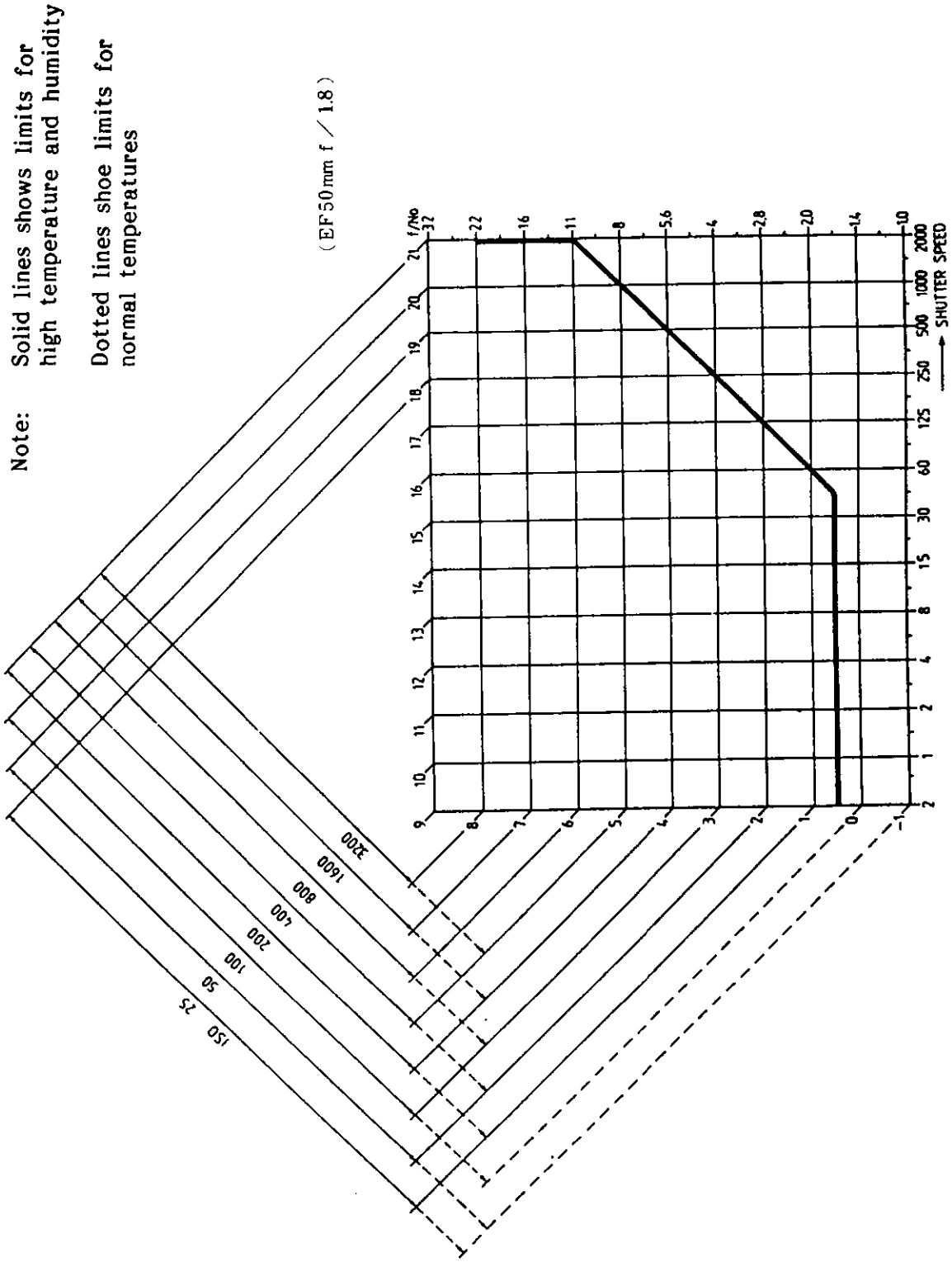
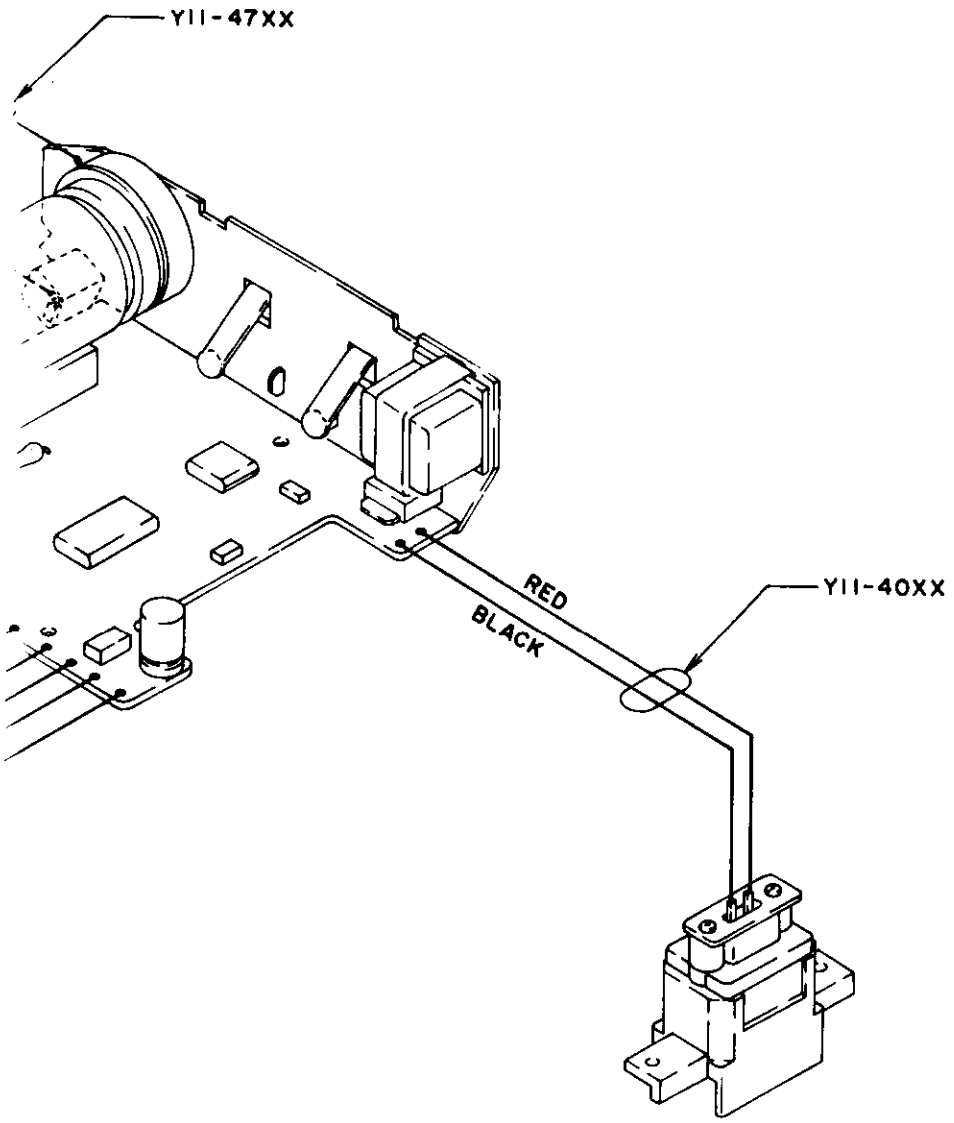

Note: Solid lines shows limits for high temperature and humidity
Dotted lines shoe limits for normal temperatures
(EF50mm f / 1.8)
f/No
SHUTTER SPEED
ISO 25 50 100 200 400 800 1600 3200

Fig. 4: Light Metering Range / ISO Film Speed (with EF 50mm f/1.8 program line)

DLITE 160E

REF. NO. C50-0641



Y11-37XX
COLOR CODE

COLOR	WHITE	BLACK	RED	ORANGE	YELLOW	GREEN	BLUE
COLOR CODE	01	02	03	06	07	09	11

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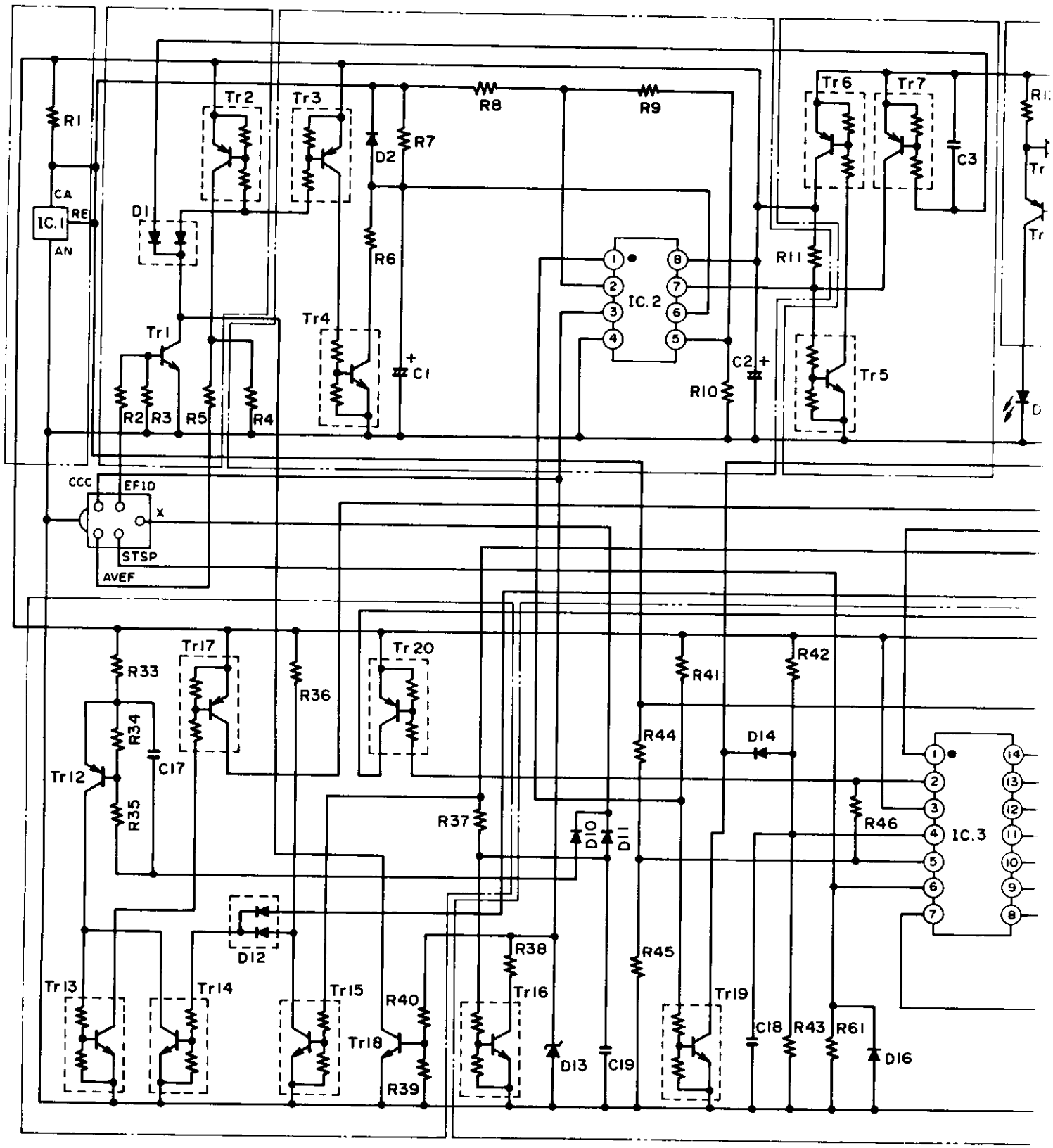
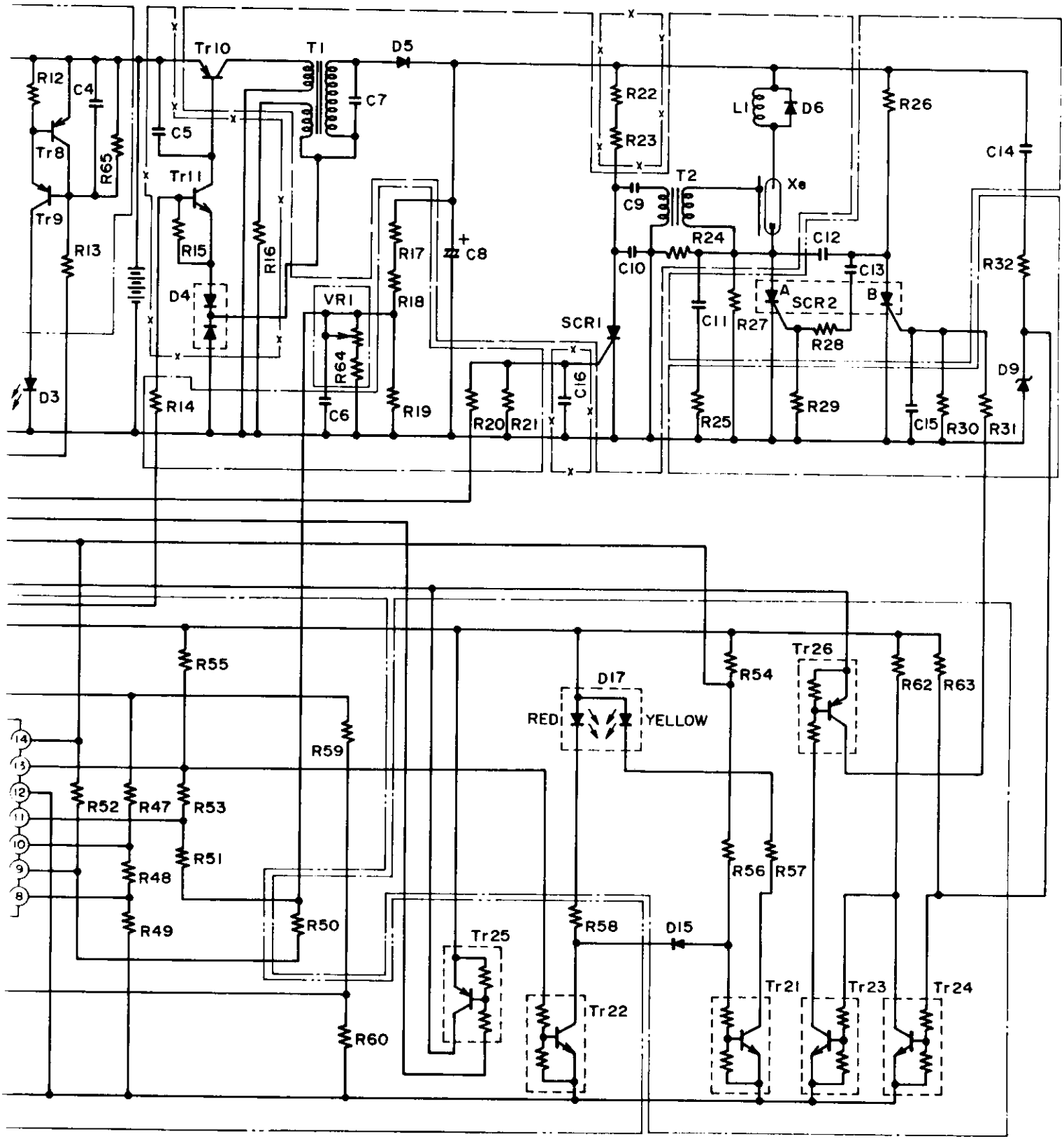
SCHEMATIC DIAGRAM



01 AUG, 1988

EEDLITE 160E



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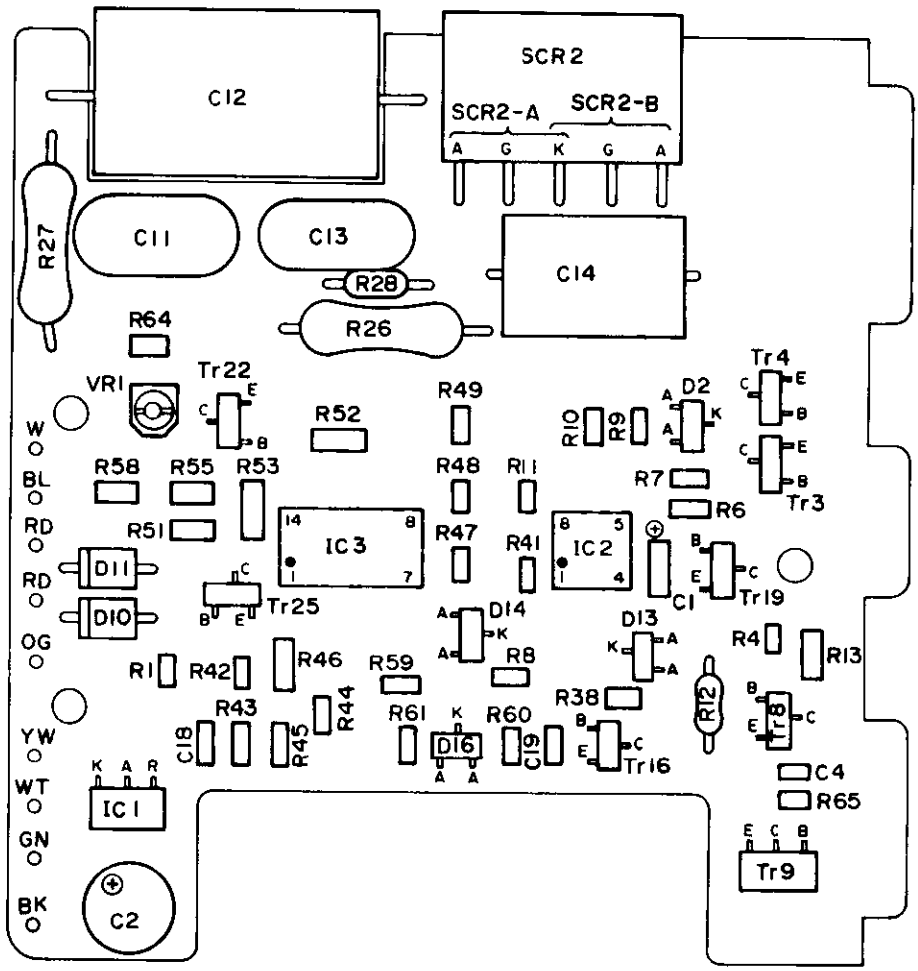
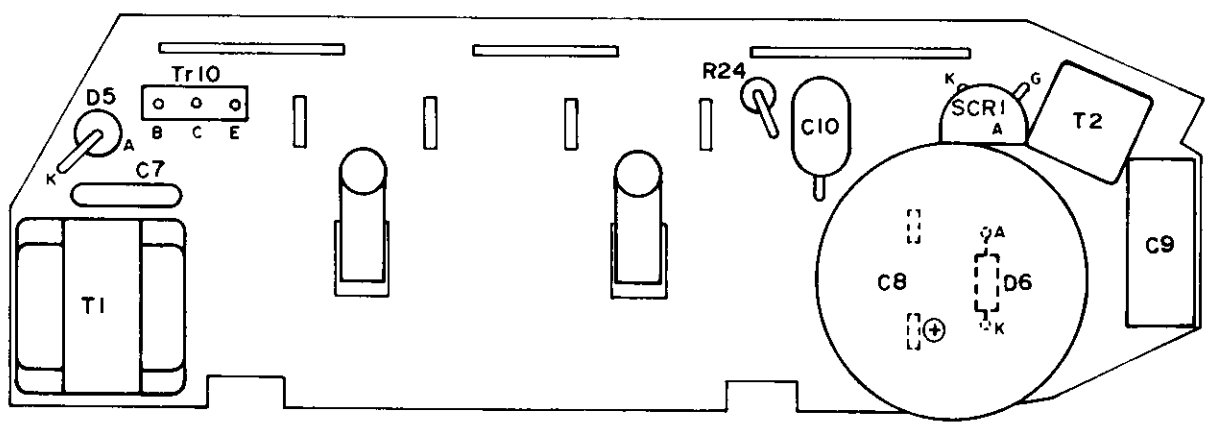
P.C.B DIAGRAM

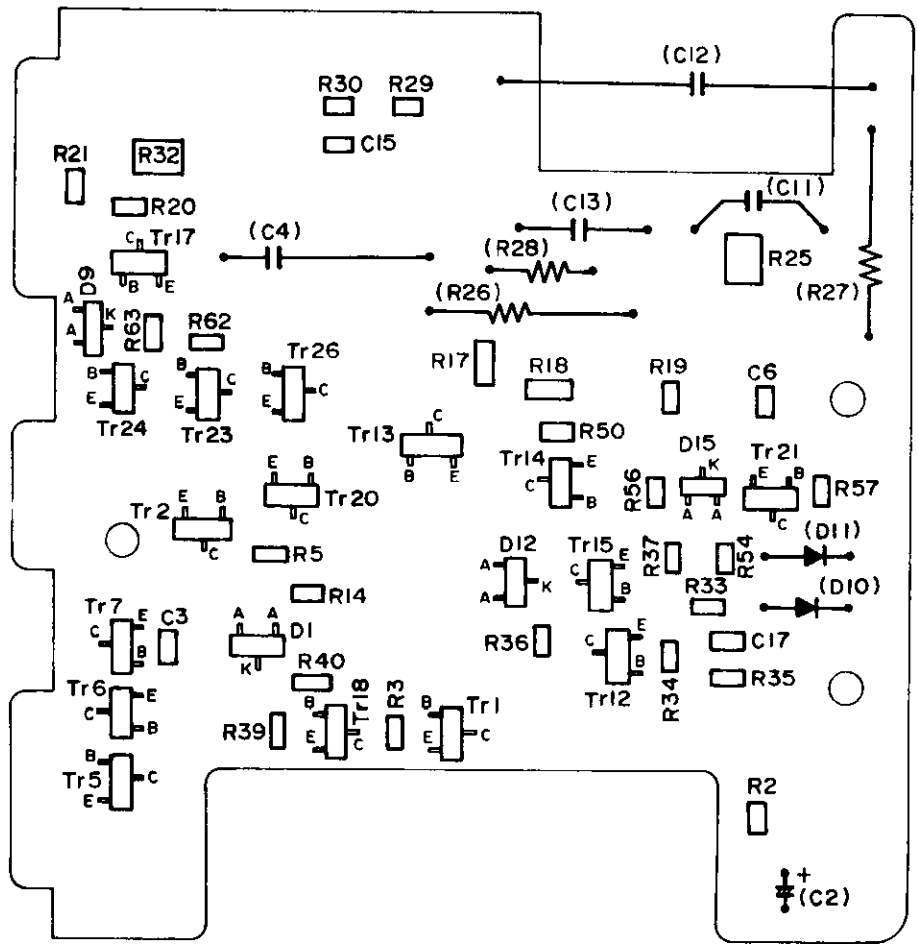
M BOARD (Y19-0426)

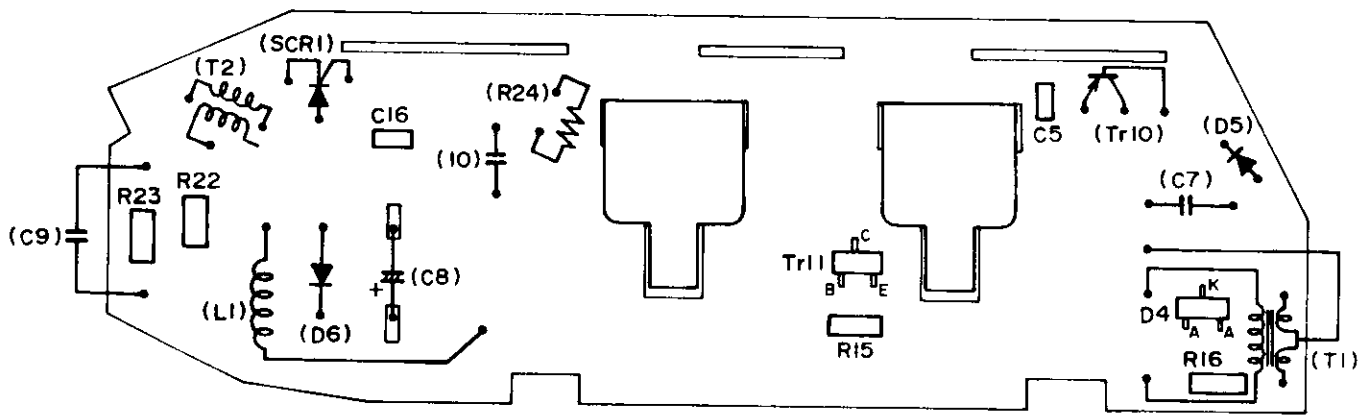


BC BOARD (Y19-0427)



( ) Reverse Side





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ELECTRIC PARTS SPECIFICATION LIST

No.	SYMBOL	REMARKS
1	I C 1	NJM431U
2	I C 2	NJM2903M
3	I C 3	NJM2901M
4	SCR 1	CR02AM8T
5	SCR 2	SA07
	Tr 1	2SC3052F
	Tr 2	FN1L4L
	Tr 3	FN1F4M
	Tr 4	FA1A4M
	Tr 5	FA1A4M
	Tr 6	RN2422
	Tr 7	FN1A4M
	Tr 8	2SA1235F
	Tr 9	2SA1213Y
6	Tr 10	2SA1615
	Tr 11	2SC2859Y
	Tr 12	2SA1235F
	Tr 13	FA1A4M
	Tr 14	FA1A4M
	Tr 15	FA1A4M
	Tr 16	FA1A4M
	Tr 17	FN1A4M
	Tr 18	2SC3052F
	Tr 19	FA1A4M
	Tr 20	FN1L3M
	Tr 21	FA1A4M
	Tr 22	FA1A4M
	Tr 23	FA1A4M
	Tr 24	FA1A4M
	Tr 25	FN1L3M
	Tr 26	FN1L3M
	C 1	4.7 μF 4V
	C 2	100 μF 6.3V
	C 3	0.047μF 50V
	C 4	0.01 μF 50V
	C 5	0.01 μF 50V
	C 6	0.01 μF 50V
	C 7	100 PF 2KV
7	C 8	280 μF 330V
	C 9	0.047μF 250V
	C 10	0.047μF 160V
	C 11	0.033μF 250V
	C 12	1.2 μF 100V
	C 13	0.047μF 100V
	C 14	0.1 μF 100V
	C 15	0.022μF 25V
	C 16	0.01 μF 50V
	C 17	0.047μF 50V
	C 18	0.01 μF 50V
	C 19	0.01 μF 50V

No.	SYMBOL	REMARKS
	R 1	1KΩ 1/10W
	R 2	27KΩ 1/10W
	R 3	47KΩ 1/10W
	R 4	75KΩ 1/10W
	R 5	430 Ω 1/10W
	R 6	1KΩ 1/10W
	R 7	1.62MΩ 1/10W
	R 8	20KΩ 1/10W
	R 9	20KΩ 1/10W
	R 10	68KΩ 1/10W
	R 11	4.7 KΩ 1/10W
	R 12	4.42 Ω 1/5W
	R 13	1KΩ 1/8W
	R 14	1KΩ 1/10W
	R 15	10KΩ 1/8W
	R 16	10KΩ 1/8W
	R 17	5.1 MΩ 1/8W
	R 18	5.1 MΩ 1/8W
	R 19	510KΩ 1/10W
	R 20	1KΩ 1/10W
	R 21	1KΩ 1/10W
	R 22	470KΩ 1/8W
	R 23	470KΩ 1/8W
	R 24	33 Ω 1/5W
	R 25	22 Ω 1/4W
8	R 26	15KΩ 1W
	R 27	10KΩ 1W
	R 28	1KΩ 1/5W
	R 29	470 Ω 1/10W
	R 30	100 Ω 1/10W
	R 31	100 Ω 1/10W
	R 32	10KΩ 1/4W
	R 33	510 Ω 1/10W
	R 34	1KΩ 1/10W
	R 35	1KΩ 1/10W
	R 36	10KΩ 1/10W
	R 37	10KΩ 1/10W
	R 38	5.6KΩ 1/10W
	R 39	68KΩ 1/10W
	R 40	27KΩ 1/10W
	R 41	10KΩ 1/10W
	R 42	47KΩ 1/10W
	R 43	47KΩ 1/10W
	R 44	27KΩ 1/10W
	R 45	75KΩ 1/10W
	R 46	2.2MΩ 1/8W
	R 47	47KΩ 1/10W
	R 48	13.7KΩ 1/10W
	R 49	36KΩ 1/10W
	R 50	1KΩ 1/10W
	R 51	1KΩ 1/10W
	R 52	2.2MΩ 1/8W
	R 53	2.2MΩ 1/8W

No.	SYMBOL	REMARKS
	R 54	4.7KΩ 1/10W
	R 55	10KΩ 1/10W
	R 56	10KΩ 1/10W
	R 57	510 Ω 1/10W
	R 58	1KΩ 1/10W
	R 59	75KΩ 1/10W
	R 60	24KΩ 1/10W
	R 61	510KΩ 1/10W
	R 62	27KΩ 1/10W
	R 63	4.7KΩ 1/10W
	R 64	39KΩ 1/10W
	R 65	39KΩ 1/10W
	D 1	1S2838
	D 2	1S2838
	D 3	TLRA270
	D 4	1S2838
	D 5	ES-01F
	D 6	S5688G
	D 9	RD3.3MBI
	D 10	S5688G
	D 11	S5688G
	D 12	1S2838
9	D 13	RD8.2MBI
	D 14	1S2838
	D 15	1S2838
10	D 16	RD8.2MBI
	D 17	LN02102C13 (LF)
11	T 1	FK-48B
12	T 2	KP-33
13	L 1	FCH-12
14	Xe	CXC-2165-Q1
	VR 1	RH03A3A

No.	Part No.
1	Y17-0891-000
2	Y17-0892-000
3	Y17-0893-000
4	Y17-0911-000
5	Y17-0912-000
6	Y17-0894-000
7	Y17-0916-000
8	VR5-0810-103
9	Y17-0910-000
10	Y17-0910-000
11	Y17-0886-000
12	Y17-0887-000
13	Y17-0889-000
14	Y17-0885-000

※ No. 1 through 14 are stocked individually. Part Numbers are listed in the block in the lower right corner.

ADDITIONAL INFORMATION

	Page
SYSTEM COMPATIBILITY	4-1
IDIOSYNCRASIES	4-1

SYSTEM COMPATIBILITY

The Speedlite 160E was designed as the dedicated flash for the EOS 850. It can be used with the EOS 750 and EOS 650/620. Although it will fire on some other cameras, it cannot be used correctly with other cameras.

Camera	Flash Operation	Compatible
EOS 750	Same as EOS 850	Yes
EOS 650/620	Flashes every release, TTL mode (regardless of lighting)	Yes
T90	Can be used as TTL flash with T90 in manual mode. In any other mode, the camera will not operate correctly. (Removing the 160E returns camera to normal).	Limited
A-1	Camera will not release	No
Other T and A series cameras	Full power flash every release, At "B", may fire before charged	No

IDIOSYNCRASIES

1. Energy-saving (SE) is canceled under the following conditions.

   A. When the EOS 620/650 main switch is set to "L".

   B. With the EOS 620/650 main switch at "L", any other button is pushed.

   C. Whenever the lens is attached, the lens' AF/M switch moved, the back cover opened or closed, or the battery checked. (This applies to all EOS cameras).

   Design. Energy-saving is canceled and the flash charges, but with no other input energy-saving is initiated again after eight seconds.

   This happens because the DC-DC convertor is activated and communication (EFID, CCC) between the camera and flash takes place once.

2. A high voltage static charge accidentally applied to the contacts (or mounting screws) can cause the flash to fire and SE to reset.

   A high voltage static charge around 7KV or higher simulates the trigger coil output.

3. If the shutter is released during the quick flash interval before the flash is fully charged, and the subject is near the distance limit of the fully charged flash; the results will be about two stops underexposed.

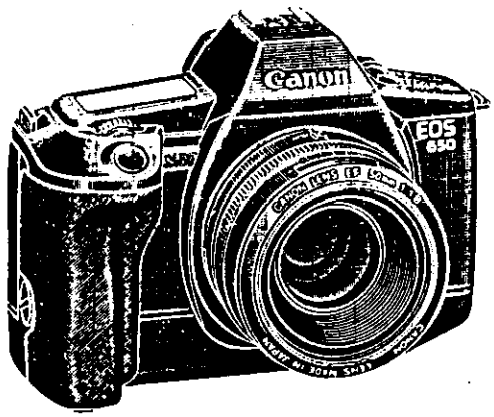
4. If the flash battery is nearly dead, the camera will not release.

   The EOS 750/850 are designed so the shutter will not release until the flash is charged. If the flash doesn't charge, the camera will not release.

5. If the flash battery is installed while SW1 is pressed, the AF Illuminator will fire.

   A spurious signal is input to the AF illuminator comparator.

EOS
TROUBLE
SYMPTOMS



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NAS01-003-001

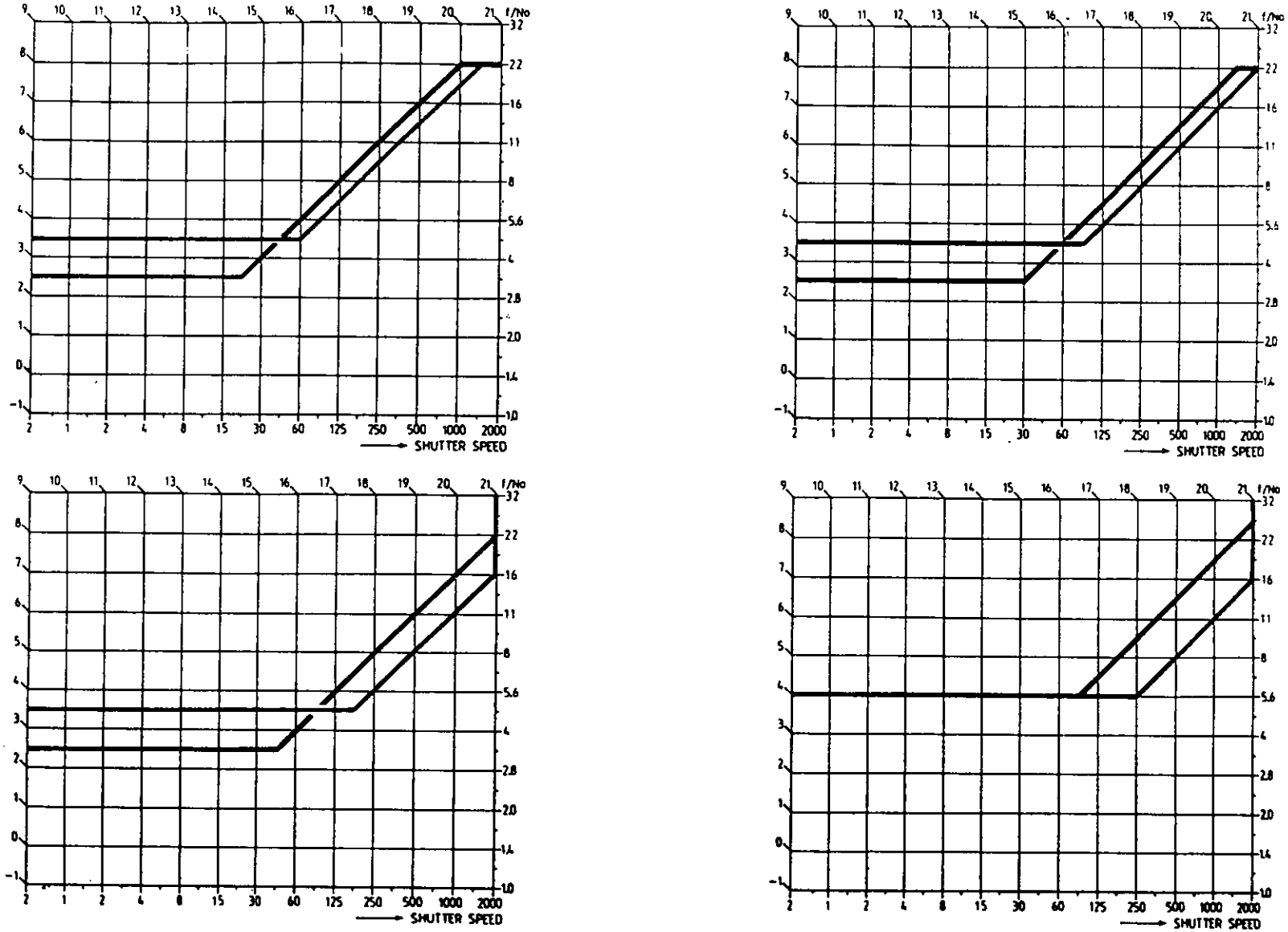


Fig. 5: 'Intelegent Program' AE Characteristics
(for typical zoom lenses)

EOS
TROUBLESHOOTING
GUIDE

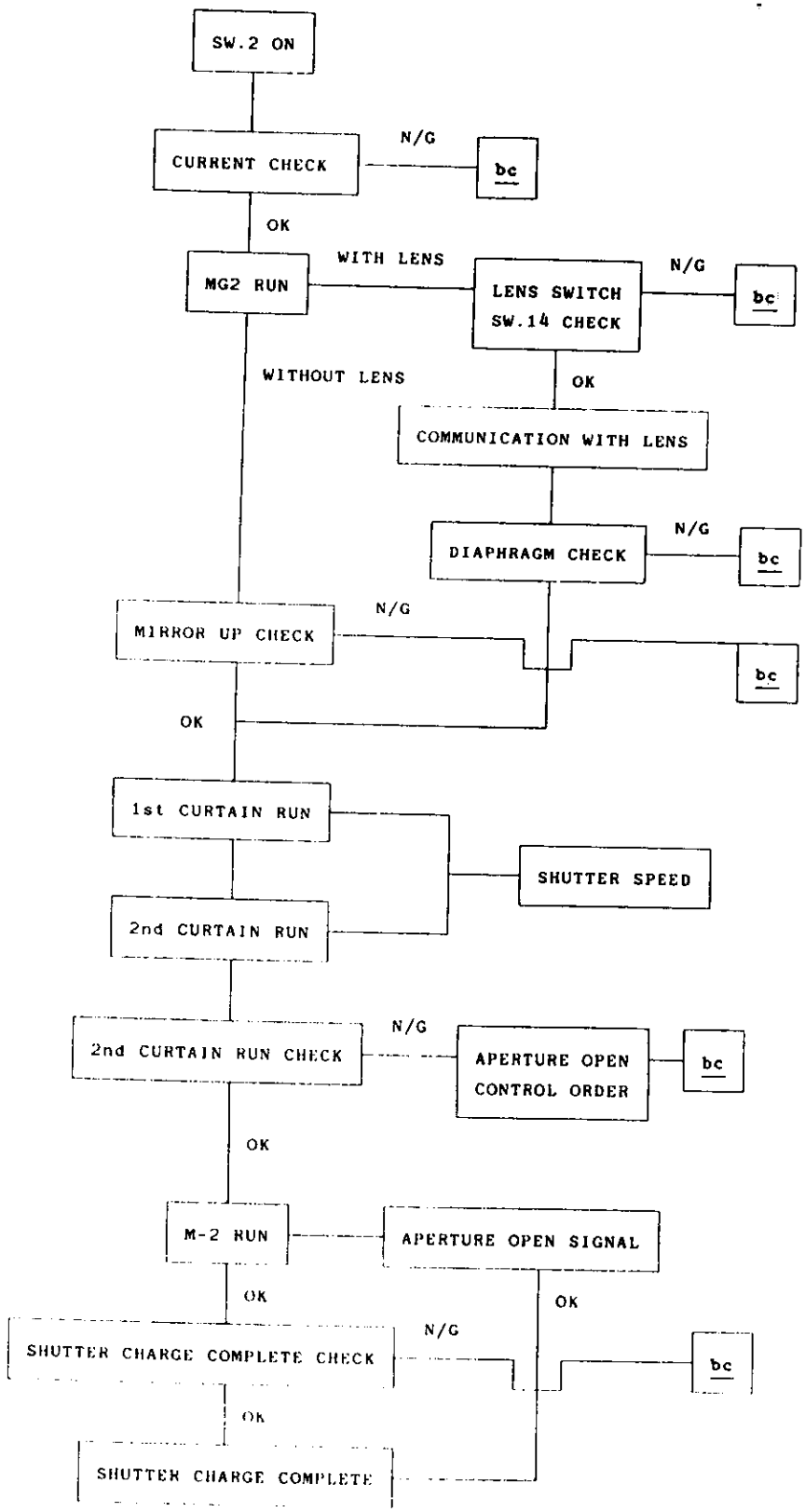
USE THE FOLLOWING TOOLS IN CONJUNCTION WITH THIS TROUBLE SHOOTING GUIDE :

1. LOW VOLTAGE POWER SUPPLY
2. TOOL BATTERY
3. RESET SCREW
4. OSCILLOSCOPE

* THIS CHART IS BASED ON EOS SEQUENCE
USE THE EOS REPAIR SERVICE MANUAL DIAGRAM

DATA COMPILED BY KAZUYA YAMAMOTO
CANON U.S.A.
NEW YORK CAMERA SERVICE DIVISION
EDITED BY JAMES C. MARTIN

EOS RELEASE SEQUENCE



MEANING OF bc DISPLAY

INHIBIT VOLTAGE N/G

APERTURE WON'T STAY OPENED

DIAPHRAGM DOESN'T CLOSE TO PROPER SETTING

MIRROR DOESN'T GO UP

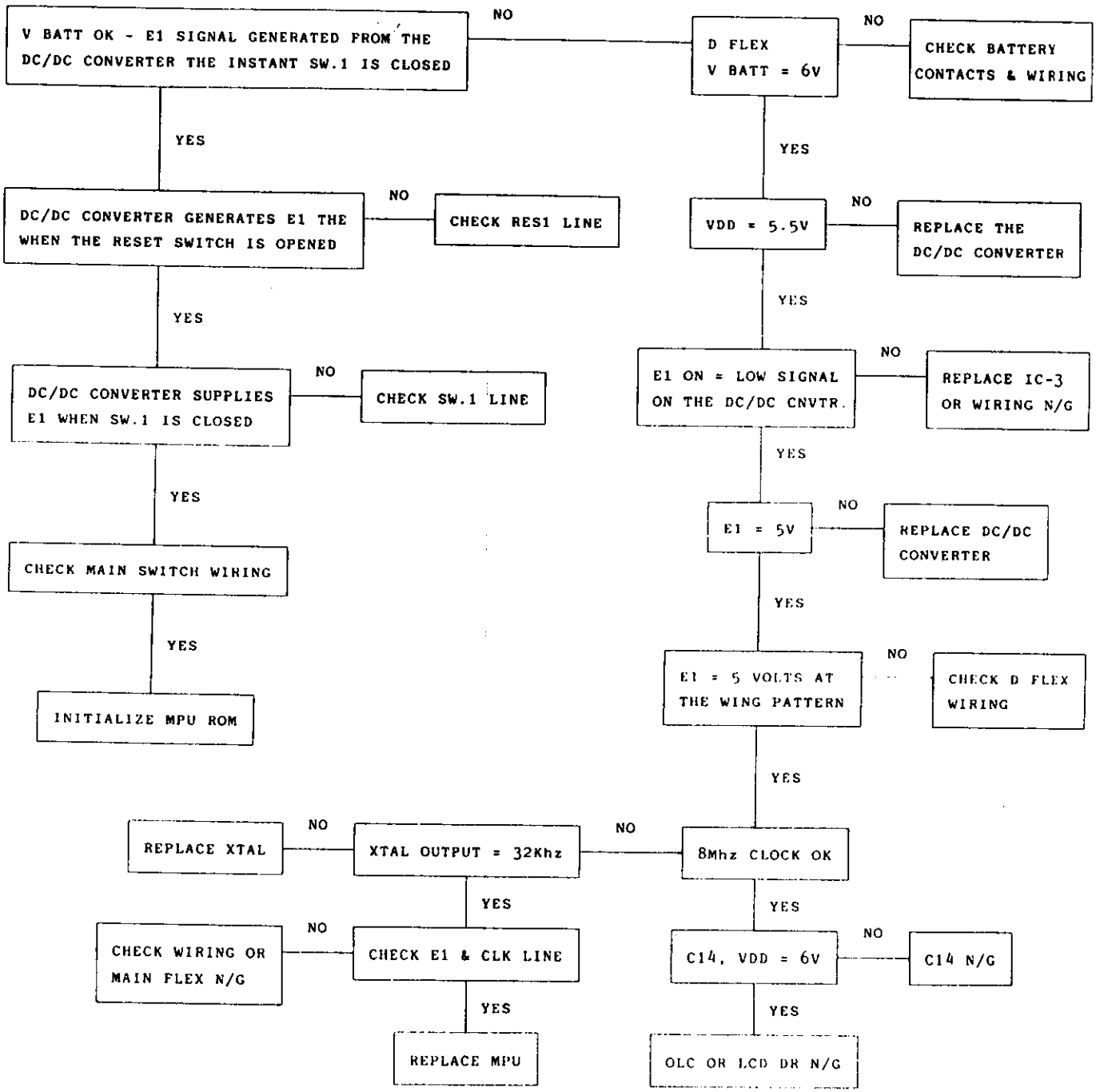
2nd CURTAIN DOESN'T RUN

SHUTTER DOESN'T CHARGE

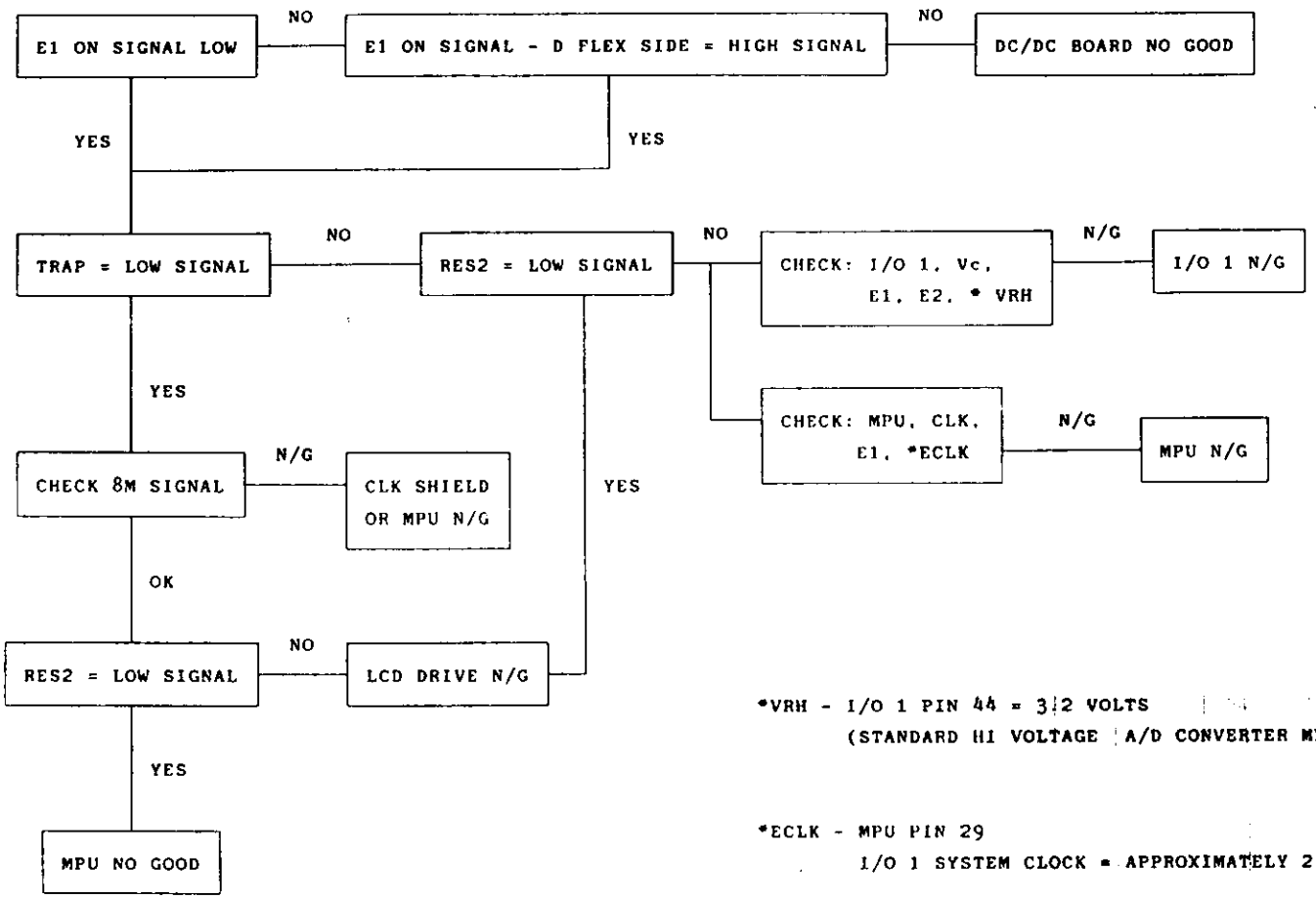
EOS TROUBLESHOOTING GUIDE

PROBLEM	PAGE
1. NO RELEASE	-1-
2. E1 CONSTANTLY ON - NO RELEASE	-2-
3. MIRROR STAYS UP - "bc" FLASHING (WITHOUT LENS)	-3-
4. MIRROR STAYS UP - "bc" FLASHING (WITH LENS)	-4-
5. NO DISPLAY	-5-

1. NO POWER - NO DISPLAY - NO RELEASE



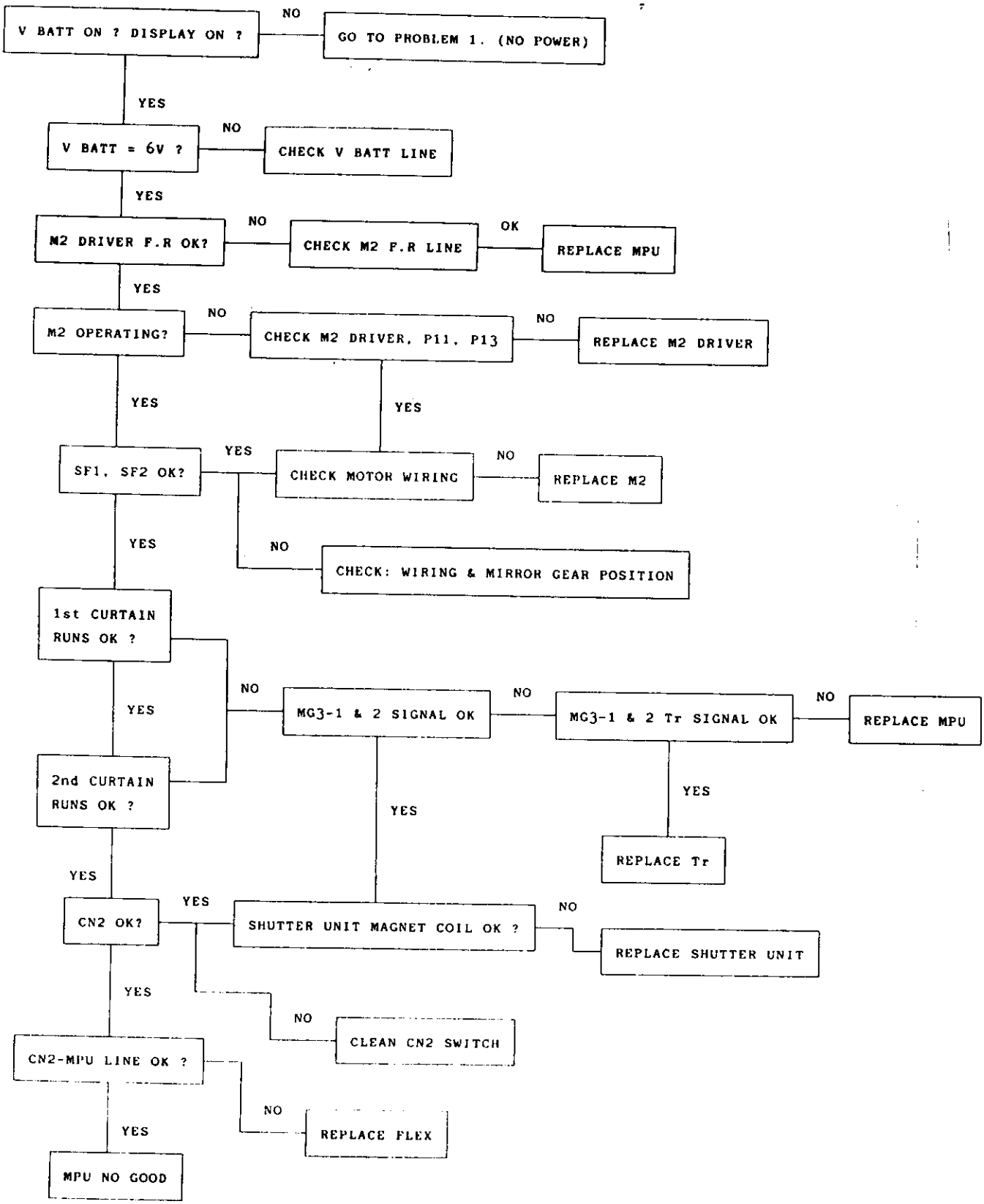
2. E1 CONSTANTLY ON - NO RELEASE



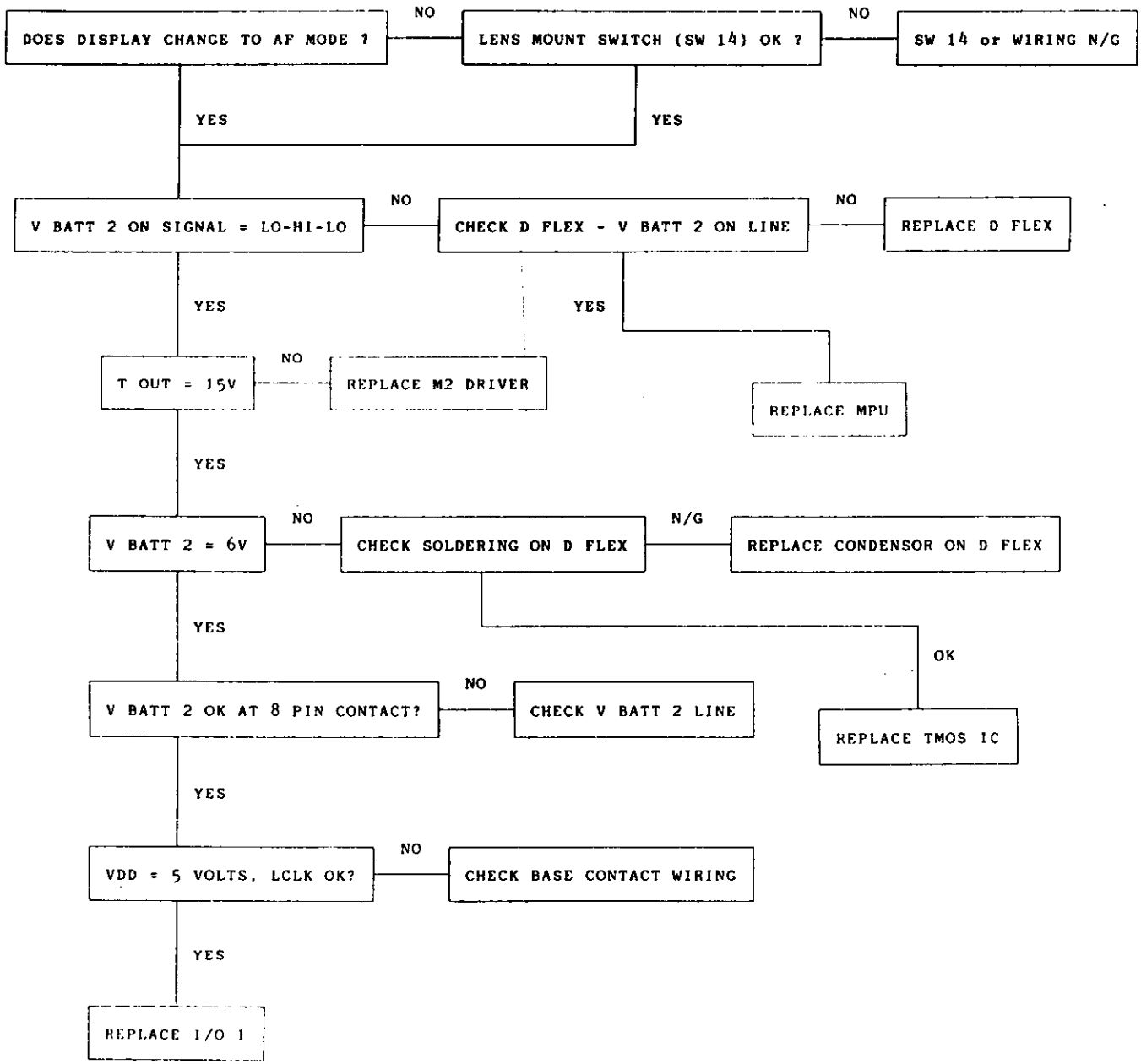
*VRH - I/O 1 PIN 44 = 3|2 VOLTS
(STANDARD HI VOLTAGE A/D CONVERTER MPU)

*ECLK - MPU PIN 29
I/O 1 SYSTEM CLOCK = APPROXIMATELY 2 Mhz

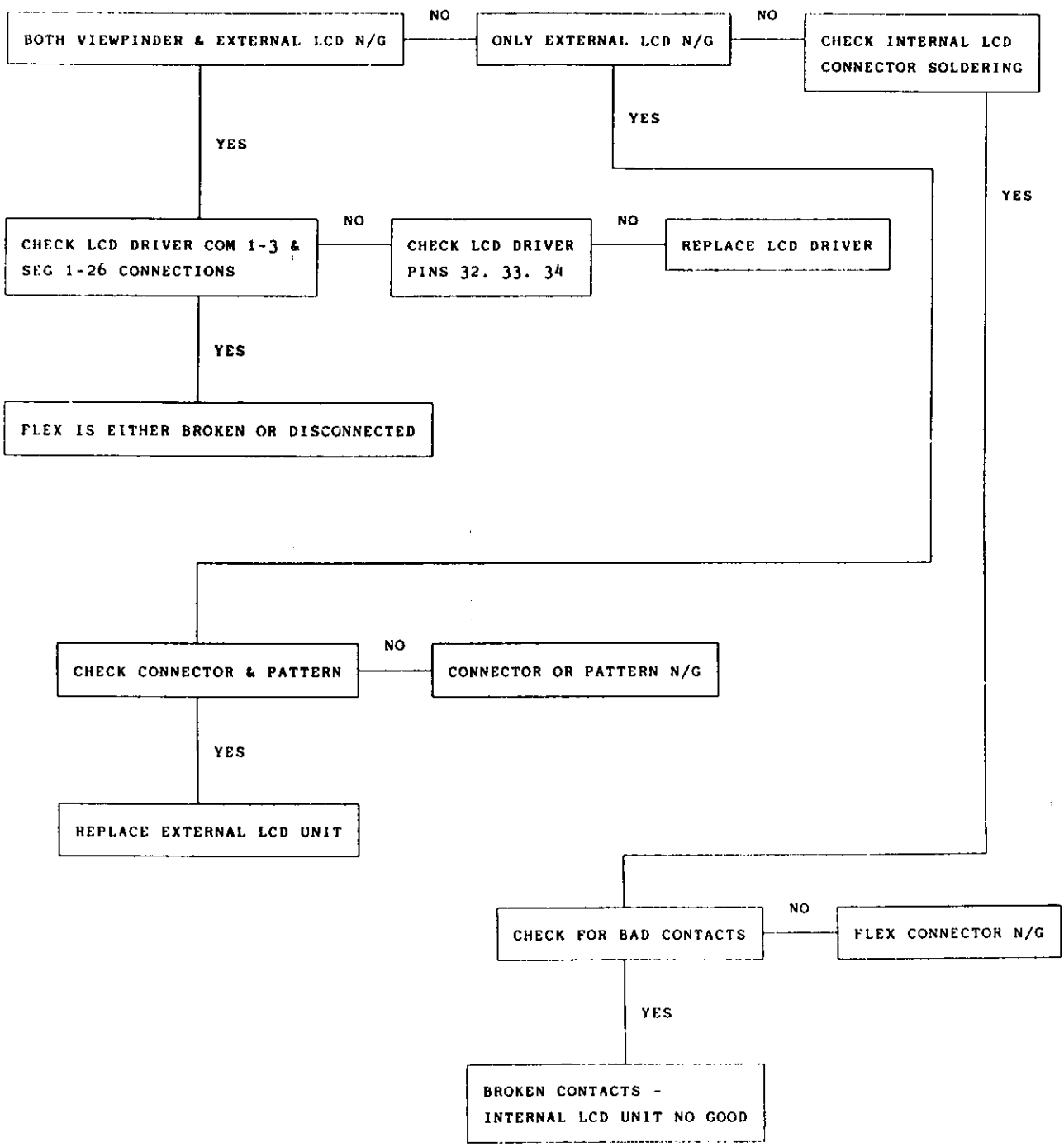
3. MIRROR STAYS UP - "bc" FLASHING (WITHOUT LENS MOUNTED)

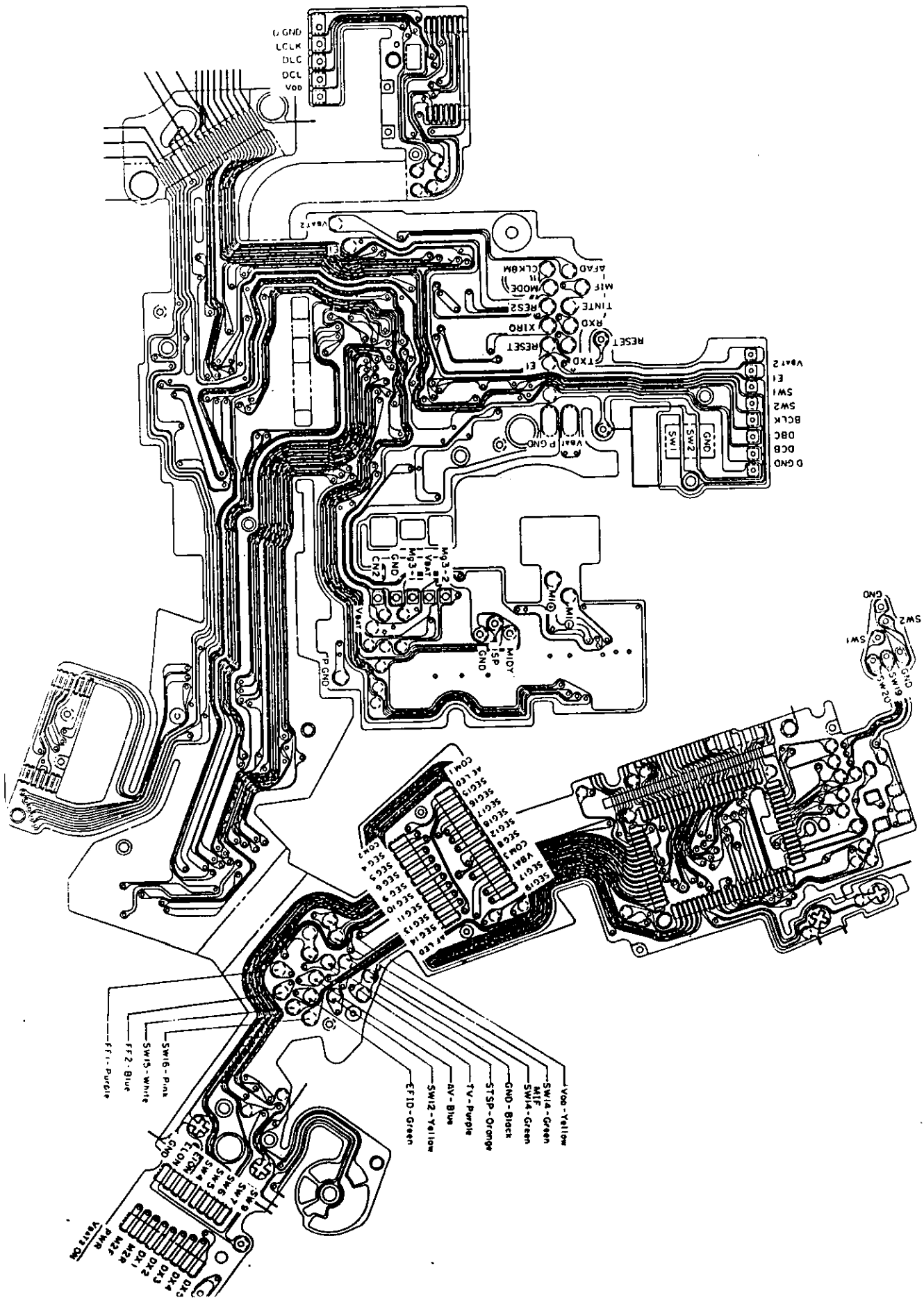


4. MIRROR STAYS UP - "bc" FLASHING (WITH LENS MOUNTED)



5. NO DISPLAY


BOTH VIEWPINDER & EXTERNAL LCD N/G
NO
ONLY EXTERNAL LCD N/G
NO
CHECK INTERNAL LCD CONNECTOR SOLDERING
YES
YES
YES
CHECK LCD DRIVER COM 1-3 & SEG 1-26 CONNECTIONS
NO
CHECK LCD DRIVER PINS 32. 33. 34
NO
REPLACE LCD DRIVER
YES
FLEX IS EITHER BROKEN OR DISCONNECTED
CHECK CONNECTOR & PATTERN
NO
CONNECTOR OR PATTERN N/G
YES
REPLACE EXTERNAL LCD UNIT
CHECK FOR BAD CONTACTS
NO
FLEX CONNECTOR N/G
YES
BROKEN CONTACTS - INTERNAL LCD UNIT NO GOOD


D GND
LCLK
DLC
DCL
Vdd
Vbat2
CLK8M
AFAD
MODE
MIF
TINTE
RXD
RES2
X1RO
RESET
TXD
E1
Vbat2
E1
SW1
SW2
BCLK
DBC
DCB
D GND
SW1
SW2
GND
P GND
Vbat
MIC
MIDY
ISP
GND
Mg3-2
Mg3-1
Vbat
GND
CN2
P GND
SW19
SW20
COM1
SEG16
SEG15
SEG14
SEG13
SEG12
SEG11
SEG10
SEG9
SEG8
SEG7
SEG6
SEG5
SEG4
COM2
SEG3
SEG2
COM3
VBAT
SEG1
SEG0
IRLED
FF1 - Purple
FF2 - Blue
SW15 - White
SW16 - Pink
EFID - Green
SW12 - Yellow
AV - Blue
TV - Purple
STSP - Orange
GND - Black
MIF
SW14 - Green
SW13 - Green
VDD - Yellow
GND
ELON
ESW
SW4
SW5
SW6
SW7
SW8
VBAT2 ON
PWR
M2F
DX1
M2R
DX2
DX3
DX4
DX5

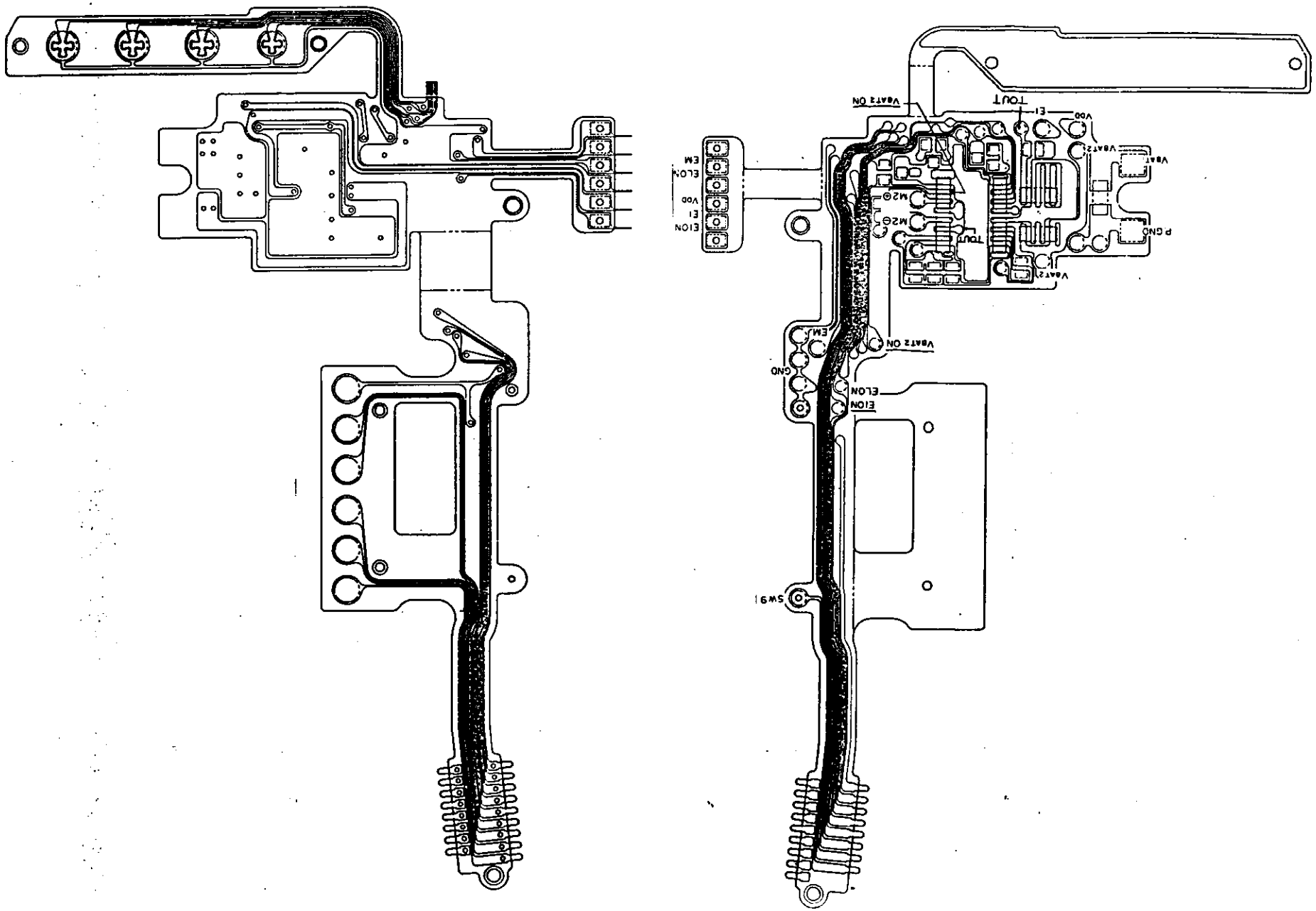

VBAT2 ON
TOUT
EI
VDD
VBAT2
VBAT
M2⊖
TOUT
P GND
VBAT2
EM
VBAT2 ON
GND
ELON
EION
SW91
EION
ELON
VDD
EI
EM

Fig. 6: TTL Flash Aperture Control (ISO 100)

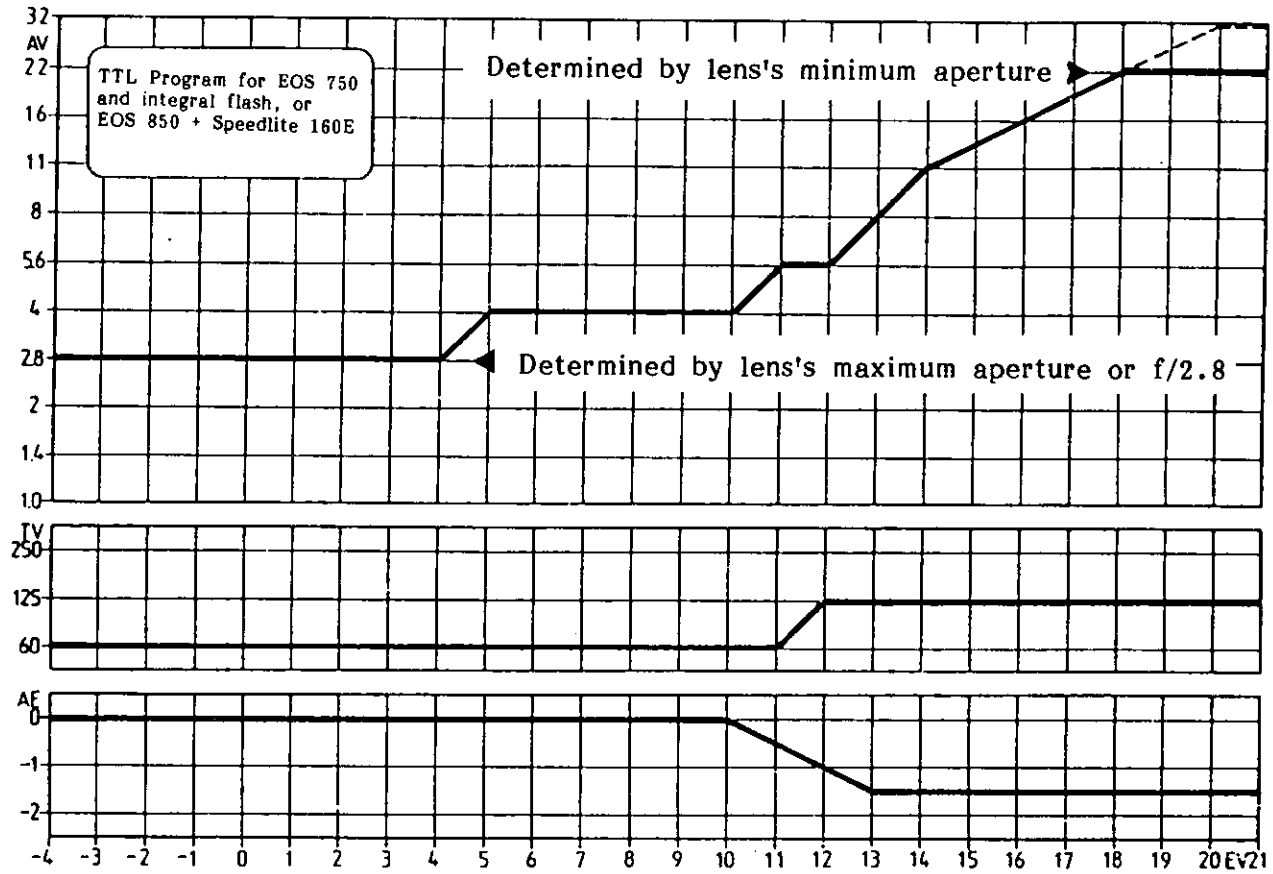
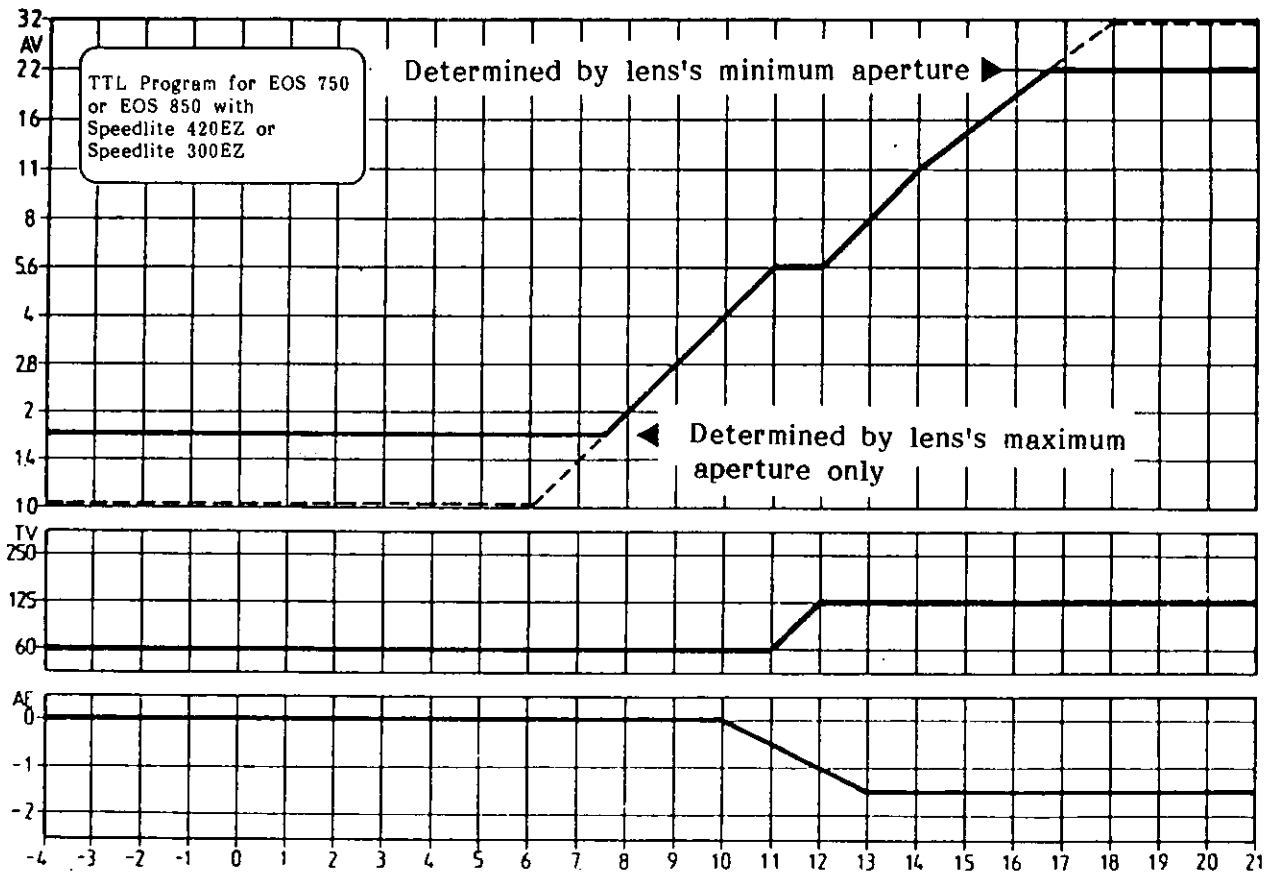


Fig. 7: A-TTL Flash Aperture Control (ISO 100)



Canon EOS 850 / 750 / 750QD

Service Manual

(English Edition)

ERATTA

Please Correct the following errors in the English version of the EOS 850 / 750 / 750QD Service Manual.

Page	Incorrect Entry	Correct Entry
2-15	Schematic Diagram - IC4 Near pin 56 in red: (19)	(18)
2-15	No entry	Add to pg. 2-15, 16, & 17: Red circled numbers indicate text numbers
2-16	Second line of # 10: (SPSP)	(STSP)
2-16	Schematic Diaphragm - IC4 Near pin6 in red: (10)	(17)
2-19	Last line: lens' LIN	lens' DLC
2-20	Manual Battery Check Voltage Beeper 5.2V or over 8Hz 4.9 to 5.2V 2Hz Below 4.9V No beeping	Voltage Beeper 4.9V or over 8Hz 4.6 to 4.9V 2Hz Below 4.6V No beeping
2-22	Next to last line: .. FF1 and FF2 both go "H"	.. FF1 and FF2 both go "L" ..
2-30	# 9, second line ... as C3 dis- ...	... as C30 dis- ...
3-5	Left Column, Removal Flow Chart # 2, Remarks: 4 Screws	5 Screws
3-5	Right Column, Third line of text: . and 6 from .	. and 5 from .

3-5 Fig. 6 & 7:

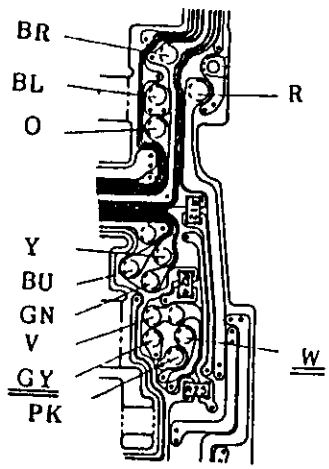


Fig. 6: Main Flex

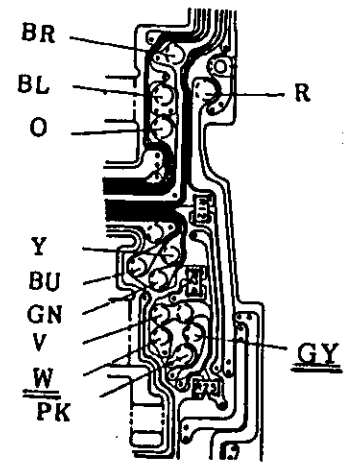


Fig. 6: Main Flex

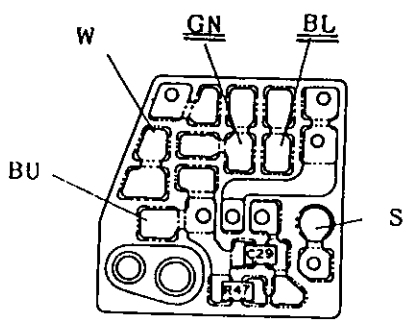


Fig. 7: Penta Board

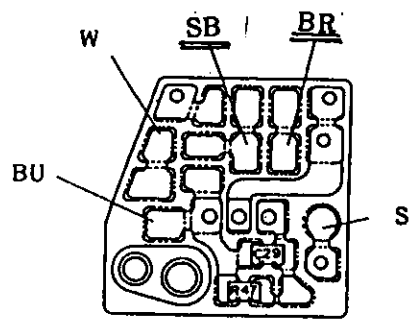


Fig. 7: Penta Board

3-7 Fig. 10, 13, & 14

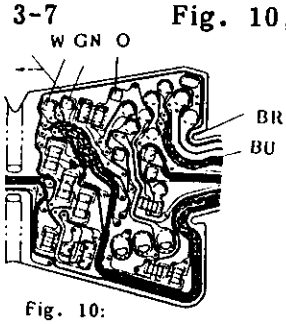


Fig. 10:

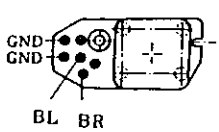


Fig. 13:

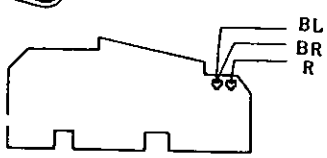


Fig. 14:

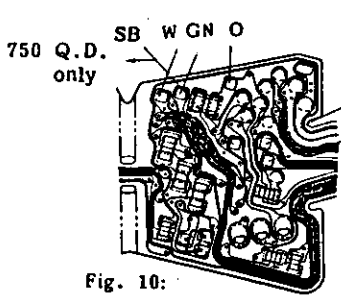


Fig. 10:

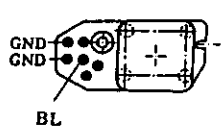


Fig. 13:

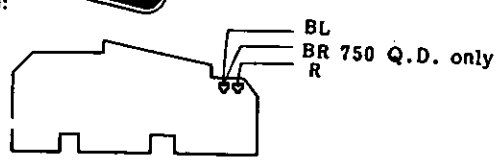


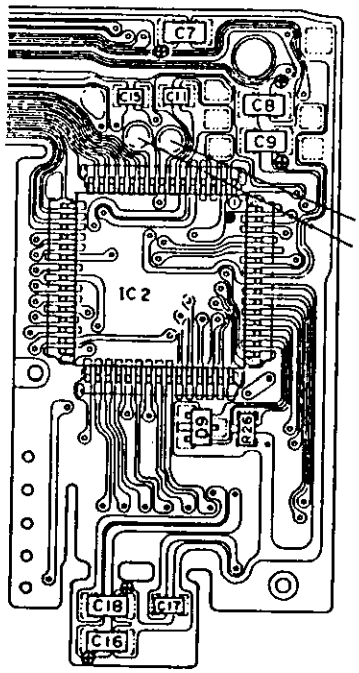
Fig. 14:

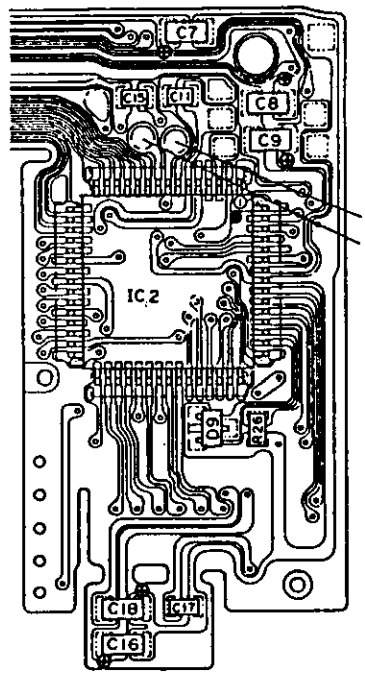
3-11 REMOVAL Flow Chart # 3, Remarks

(3) Main Flex

(3) Main Flex — Thru-holes MIF SW (2) Mount (1)

3-11 Right Column, Fig 24





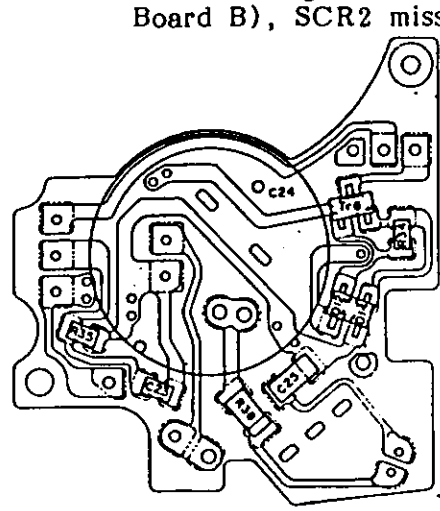
3-28 Schematic Diagram, IC2, pin 54: QCV

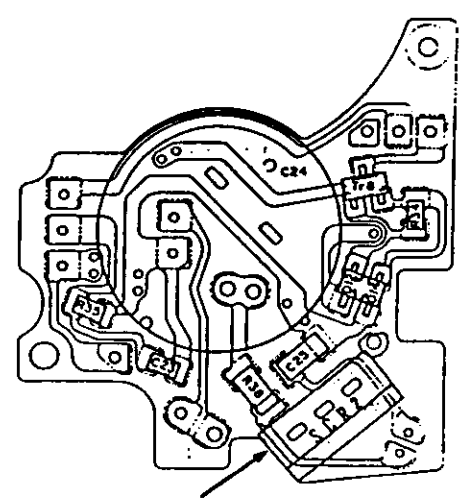
QVC

3-29 P.C.B. Diagram, Upper Right, Communications Port RES2

$\overline{\text{RESET}}$

3-35 P.C.B. Diagram, (Bottom Board B), SCR2 missing





TECHNICAL INFORMATION

	Page		Page
MECHANICAL		ELECTRONIC	
SINGLE MOTOR SYSTEM	2-1	INTRODUCTION	2-10
AUTOMATIC FLASH (EOS 750, 750 QD)	2-6	BLOCK DIAGRAM	2-11
MECHANICAL and ELECTRONIC FILM COUNTERS	2-9	TIMING CHART	2-13
		CIRCUIT EXPLANATIONS	2-14
		SWITCH TABLE	2-32
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SINGLE MOTOR SYSTEM

A single motor is used for film transport, shutter and mirror charging, and, in the EOS 750, flash retraction. The motor is vertically mounted, double-ended, and bi-directional.

1. Motor Functions and Direction

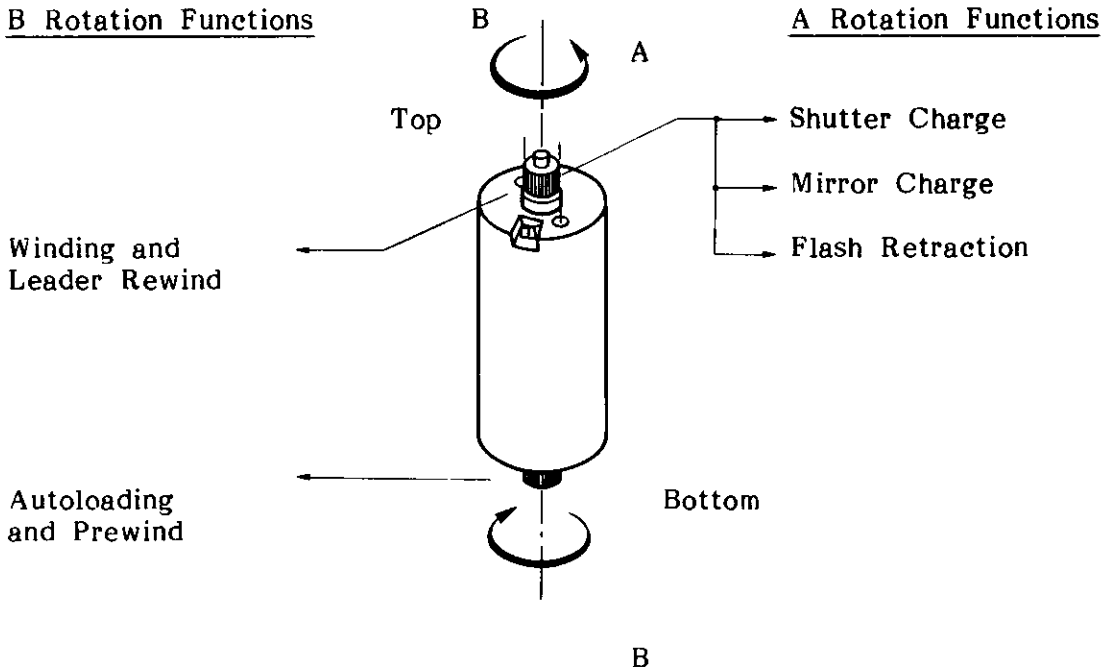


Fig. 1: Motor Functions

!!! Film transport terms: Since the film in this camera is wound completely onto the "take-up" spool when it is loaded and then wound back into the cartridge as each frame is exposed, nomenclature can be somewhat confusing. In this service manual we give priority to the familiar terms which are normally used to describe the function, so "winding" is in the direction normal for rewind.

Autoloading: Winding the first four frames of film.

Prewind: Winding the entire film onto the take-up spool.

Winding: Film transport, after each exposure, to position the next frame of film. The direction is opposite the normal winding in conventional systems.

Leader Rewind: The rewinding of the film leader back into the cartridge. Since the film is wound back into the cartridge during winding, only the leader remains to be rewound.

2. Lever Operation

Power Swift Lever:

This lever shifts the power takeoff (PTO) between the upper PTO and lower PTO when the motor is turning clockwise (B direction). Shifting is controlled by the power latch lever.

Power Latch Lever:

When the power latch lever is engaged, the lower PTO is engaged for autoloading and prewind. At the end of prewind, during the mirror cycling, it is released. With it released, the upper PTO for film winding and leader rewind is engaged. It is reengaged when the back cover is opened to remove the film.

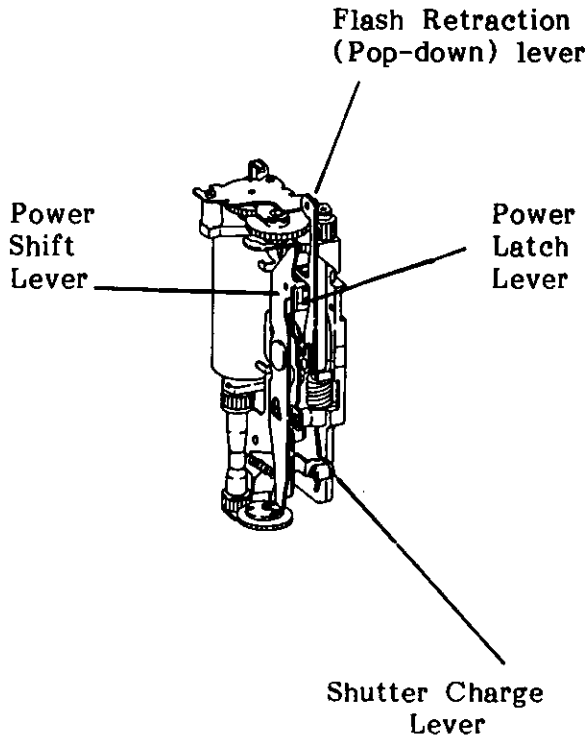


Fig. 2: Power Unit

3. Motor Direction Flow Chart

This chart shows the relationship of motor direction to the total operation from film loading through leader rewind.

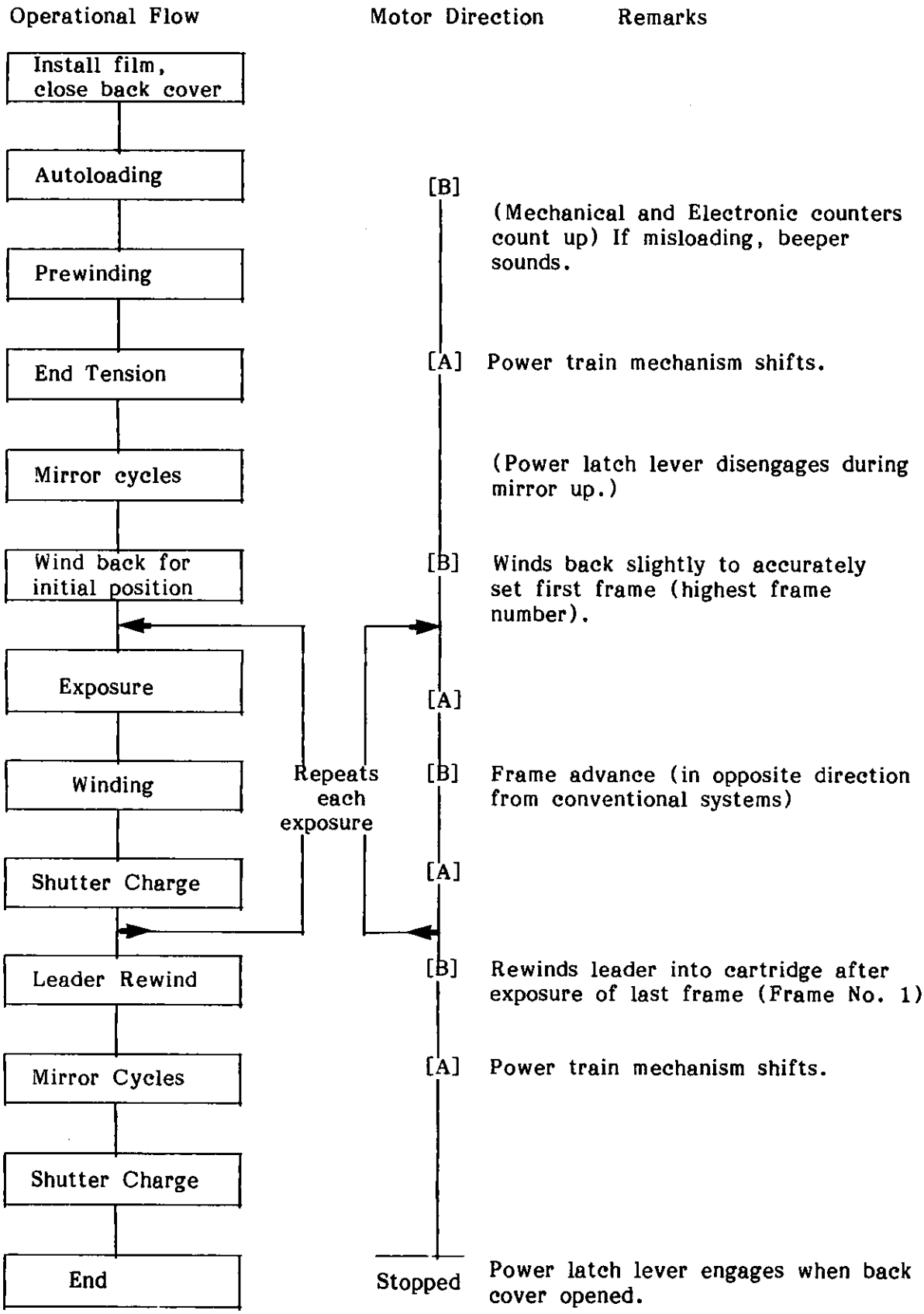


Fig 3: Motor Direction / Operational Flow Chart

4. Autoloading / Prewinding

When film is installed correctly and the back cover closed, the autoloading operation is followed by winding of the film all the way to the end until the film tension increases. At this point, the mechanism switches, the mirror cycles once and the film is rewound slightly to correctly set the first (highest number) frame in the aperture.

The autoloading is the familiar Canon "sprocket-spool" system. The sprocket initially transports the film until the spool has a grip and then the spool takes over (the same system is used in the T90). Correct loading is determined by sprocket rotation after the spool has taken over. If the film is not correctly loaded, an 8 Hz beep sounds and the shutter release is locked.

Power Unit Condition:

Lower Gear Train

Motor Direction: (B)

Power Latch engaged

When the lower gear is driven in the B direction, epicyclic gear 3 drives gear 4 eventually driving epicyclic gears 8, 8' and 9, 9' which drive the spool and sprocket.

When the motor is drive in the (A) direction, gear 3 drives gear 11 instead of gear 4, causing reversal of all gears so gears 8,8' and 9,9' disengage from the spool and sprocket.

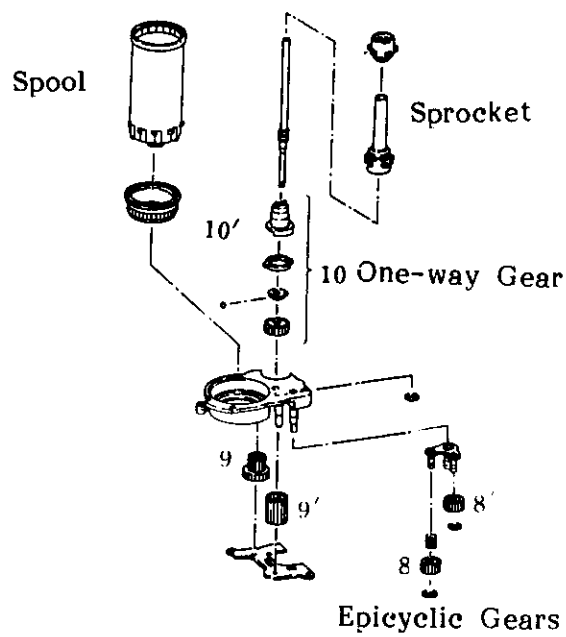


Fig. 4: Rewind System

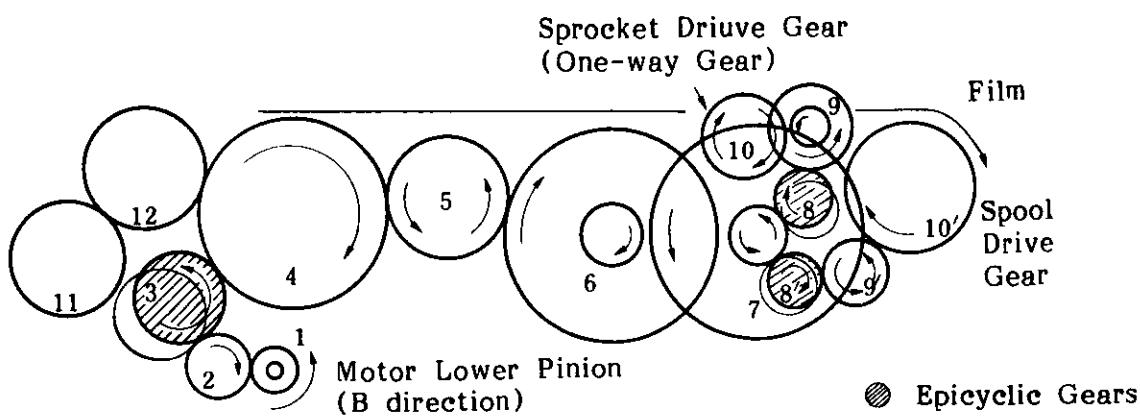


Fig. 5: Gear Train in Prewind Position

5. Shutter Charge, Mirror Operation, and Flash Mechanical Operation

Power Unit Condition:

Upper Gear Train

Motor Direction: (A)

Power Latch released during mirror up stroke

When the upper motor gear turns in the "A" direction it drives the upper gear train, gears 2 through 6. Gear 6 drives mirror cam gear (7), which in turn drives shutter charge gear (8). As they turn, their cams cause the mirror to cycle up and down once, and the shutter to charge. The flash retracting link, driven by the mirror cam gear, retracts the flash.

*: Mirror is pulled down by a spring.

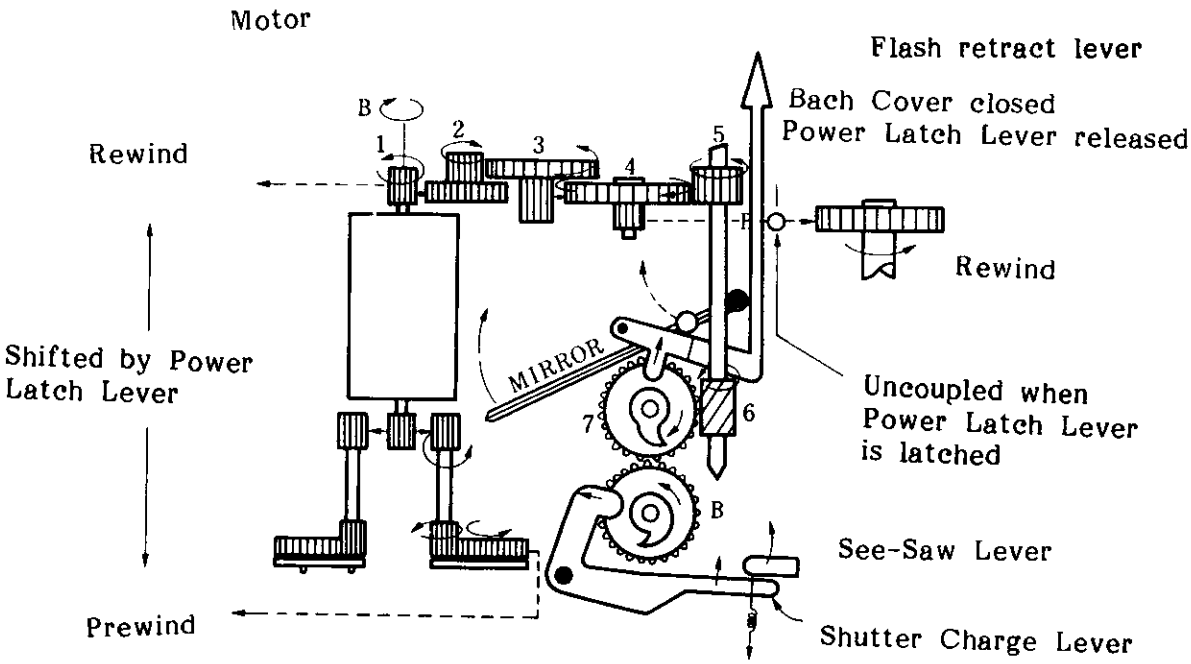


Fig. 6: Power Unit Schematic

6. Winding:

Winding in this camera is in what is normally called the "rewind" direction, but it is winding in that it sets the newt frame in the aperture. After the last frame is exposed, the leader rewinds into the cartridge.

Power Unit Condition:

Upper Gear Train

Motor Direction: (B)

Power Latch released

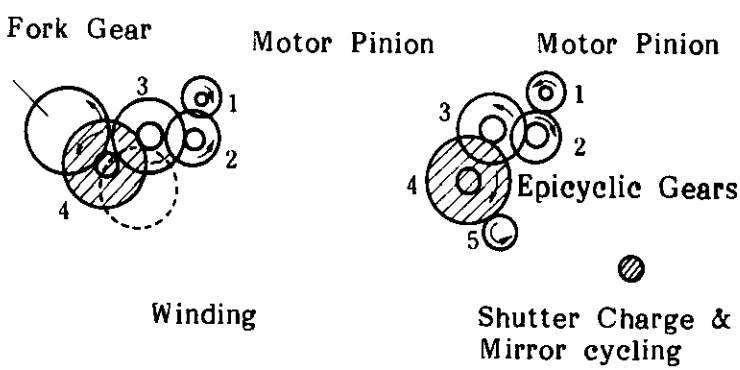


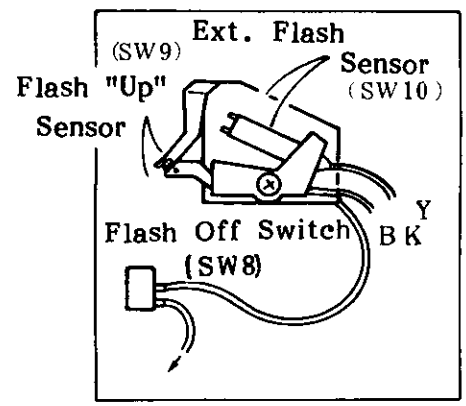
Fig. 7 : Upper Gear Train

AUTOMATIC DEPLOYMENT FLASH (EOS 750, 750 QD)

The integral flash automatically deploys and retracts. Deployment depends on the exposure data metered just after focusing is complete. If there is insufficient light or backlighting, the flash is deployed and charges. Only after charging is complete will the camera accept the SW2 on signal and release the shutter. After the exposure is complete, the flash is retracted by the winding mechanism. After each flash the capacitor is partially charged. This is called "post charge". The main purpose of post charging is to reduce the charging timelag during continuous photography.

1. Automatic Flash Deployment

In the stored position the flash is held against spring pressure by a latch. When the decision to use flash is made, a magnet releases the latch allowing the flash to deploy. When the magnet goes on the flash starts to charge. When the flash extends completely, SW9 goes on sending the signal that the flash is fully deployed to the CPU. When the capacitor is charged, the "P" mark flashes and shutter release is possible.



2. Flash Retraction

After the exposure, winding starts and the cam on the mirror cam gear forces the cam follower link up which forces the "pop-down" lever to retract the flash. Further movement of the mirror cam returns the link to the initial position. After the flash is stored, the capacitor is given a partial charge to shorten the next charge, especially in continuous mode.

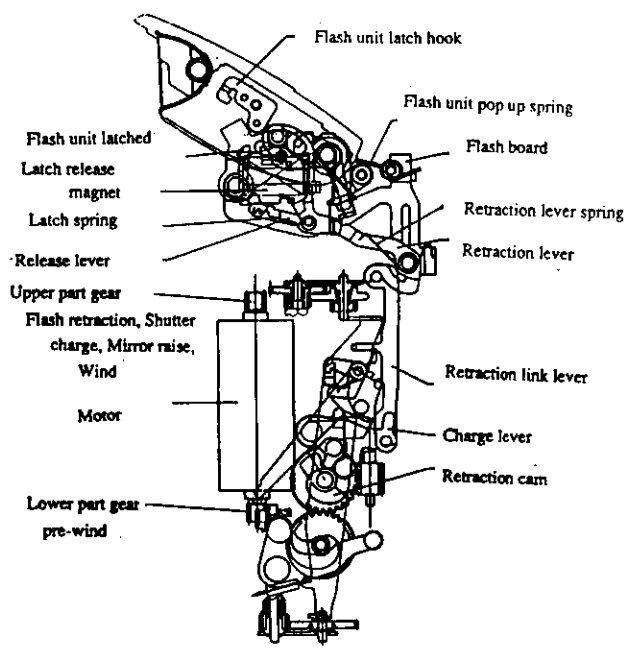


Fig. 8: Flash Mechanism

3. Electronic Flash Activation Parameters

The EOS 750 or 750 QD flash is activated under the following lighting conditions. (The same parameters apply to the Speedlite 160E used on the EOS 850 or the 750s).

Low-light flash parameters:

1. If the shutter speed selected by the program is less than 1/focal length of the lens* up to 125mm focal lengths. For focal lengths over 125mm, the activation point is 1/125 second.

   *: The actual limit is +0, -0.5EV less than 1/f.

2. If the light level of the central (A) area is less than BV5*, regardless of other conditions, the flash is activated. This is mainly to avoid the green cast in non-flash pictures under fluorescent lights which are quite prevalent in Japan.

   *: BV5 is equal to EV10 at ISO 100, but in this case, the determination is made from the brightness level so the flash fires when needed to prevent the green cast, even if high speed film is used.

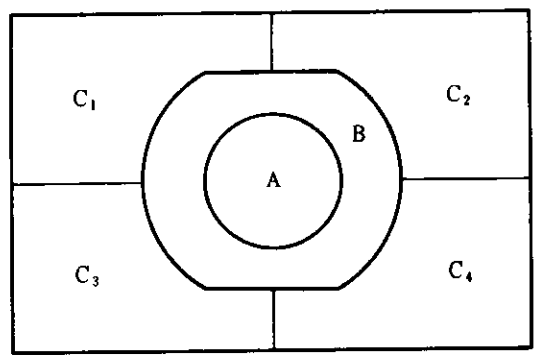


Fig. 9: Factor 6 Sensor

Backlight flash parameters:

1. When the brightness differential between the peripheral (C) areas and the intermediate (B) ring exceeds a predetermined level. (This determination is independent of evaluative metering exposure compensations.)

2. The evaluative metering program applies a variable compensation (a) according to the amount of backlighting in the original 650 and 620 models. The same program is used in these cameras, but since the 750 (and 850 when the 160E is mounted) have the option of automatic fill flash, their program is modified to substitute fill-in flash for exposure compensation when (a) exceeds a predetermined value.

The program is the same as used for Evaluative Metering determinations.

$$C < BV9: \quad E = \frac{(A + B + 2C)}{4} + a \quad \cdots\cdots(1)$$

$$C \geq BV9: \quad E = \frac{[A + B + 2(9)]}{4} + a \quad \cdots\cdots\cdots(2)$$

4. Flash Operation Flow Chart

The operational sequence for the automatic flash depends on the reason for the flash operation. There are three basic sequences.

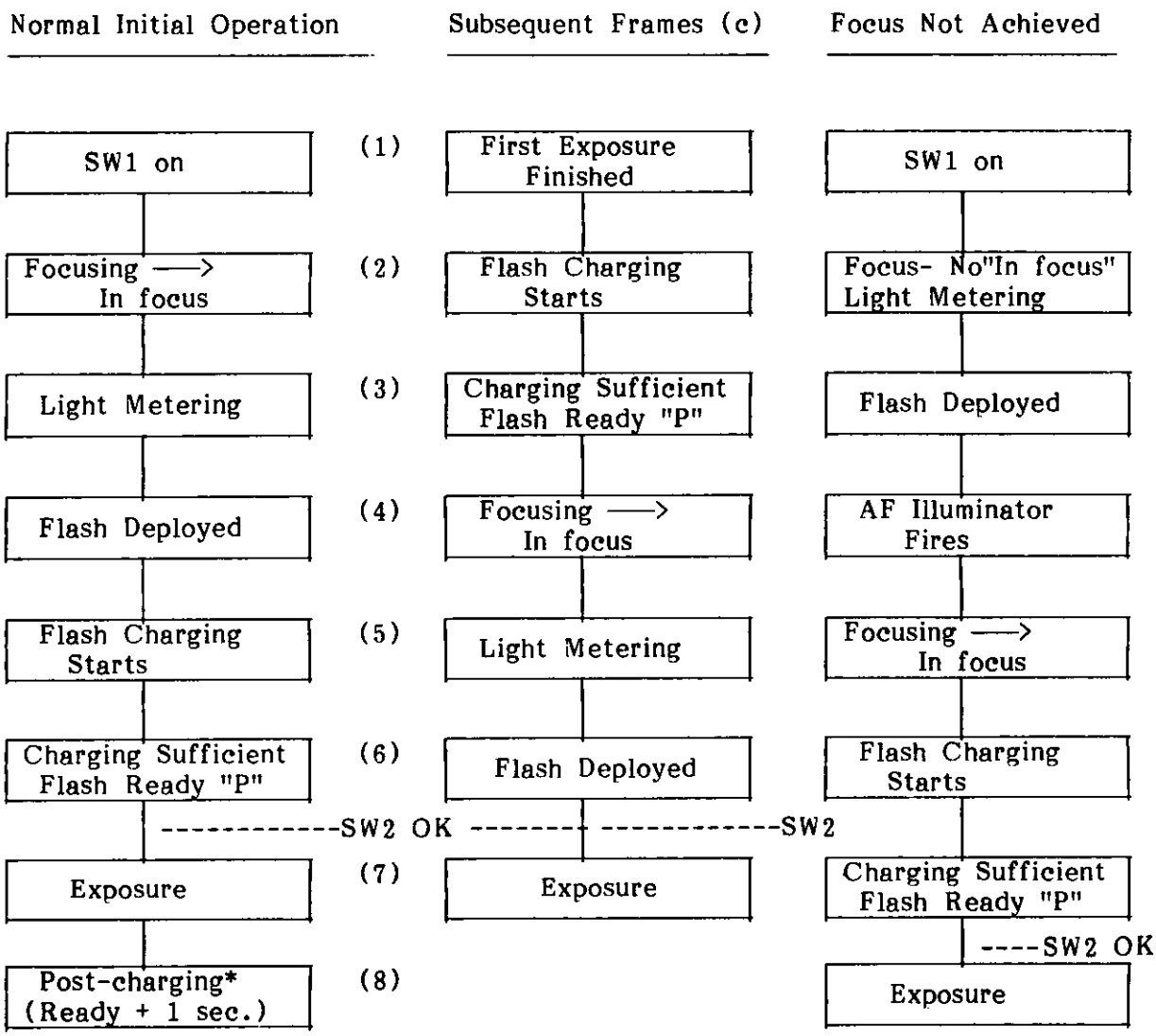


Fig. 10: Flash Flow Charts

Operation with self timer

Operation with self timer proceeds as in normal operation through step (6). Then when SW2 goes on and after a ten second delay, the shutter fires.

*: EOS 750 Integral Flash Charging

Charging continues after the "P" lights as long as SW1 is pressed or the self timer is in operation. This is to prevent self-discharge of the capacitor before SW2 is pressed. If allowed to discharge, the shutter might not release even after the "P" had lit once. This also helps to increase flash power (guide number) since the capacitor is near full charge.

MECHANICAL and ELECTRONIC FILM COUNTERS

These cameras use a mechanical film counter similar to the counter in the A-series cameras, but they also have an electronic counter built into the microprocessor, although there is no external indicator. The electronic counter makes it possible to continue shooting a roll of pre-wound film if the back cover is accidentally opened even though the mechanical counter resets.

Counter counting:

Since these cameras first wind the film to the end of the roll and then expose the film in the reverse direction, the counters count the actual number of frames wound during the pre-wind rather than a pre-determined number such as 24 or 36 exposures. During actual shooting, the counters count down.

Counter Resetting:

The mechanical counter resets to "S" whenever the back cover is opened.

The electronic counter resets under the following conditions.

1. When the film is completely rewound into the cartridge.
2. When there is no film installed and the back cover is closed.
3. When the back cover is opened during pre-wind.

If the back cover is accidentally opened during normal photography, the mechanical counter resets to "S" but the electronic counter does not, so operation can be continued after the back cover is closed.

If the back cover is opened during pre-wind, both counters reset. If the back cover is closed, pre-wind starts anew. The number of frames counted after the back cover was opened can be shot and then the remainder of the film, which was pre-wound before the back cover was opened, will be rewound into the cartridge.

TECHNICAL INFORMATION [ELECTRONIC]

INTRODUCTION

The EOS 750 and 850 are basically lower-cost versions of the EOS 650.

The circuits are quite similar also, and the chips are the same or slightly modified versions of those used in the EOS 650/620.

Here are some examples.

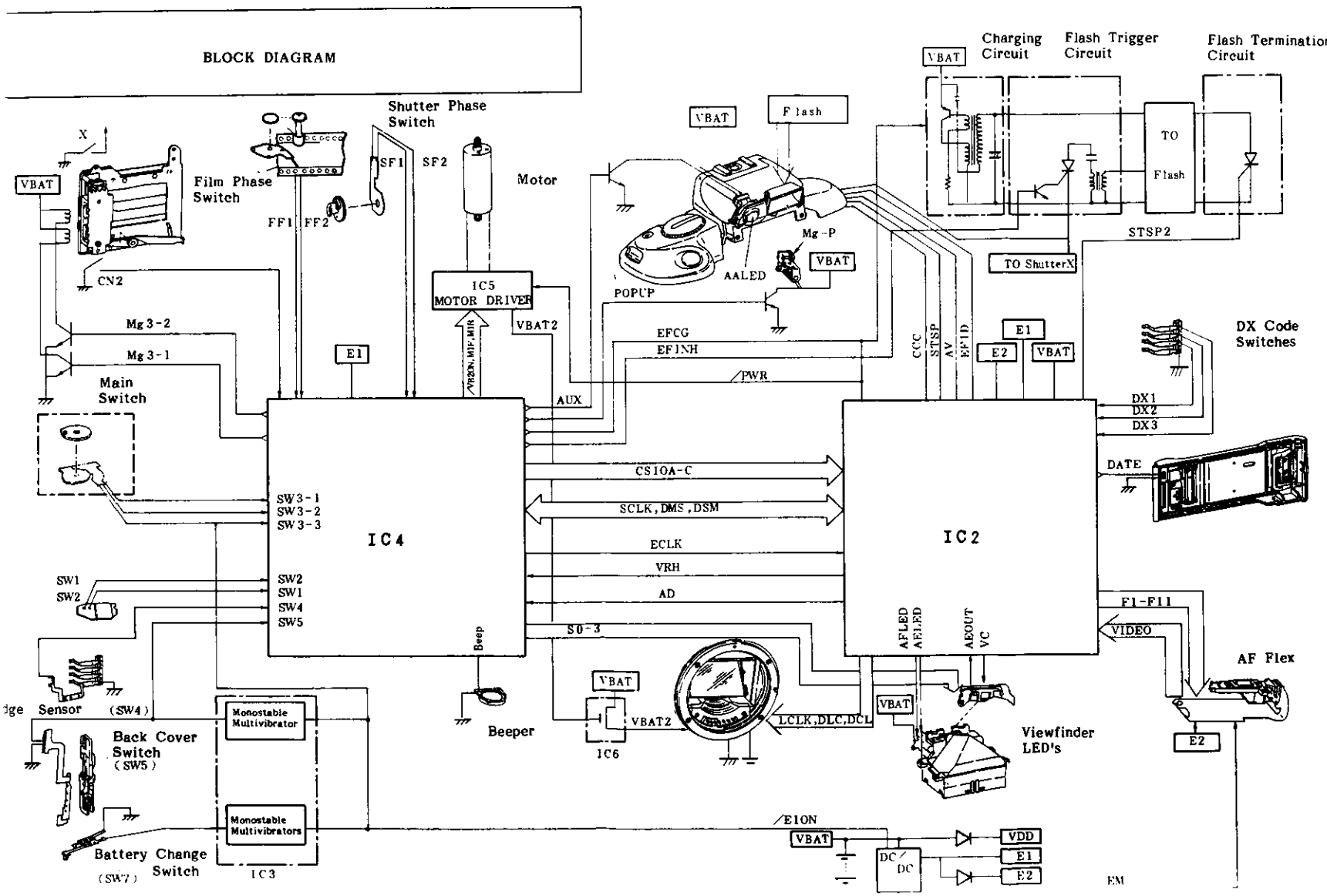
IC1	Light Metering IC	Identical
IC2	Interface IC	Combines functions of IC5 & 6 of 650
IC4	Microprocessor	Identical IC, programming is different
IC5	Motor Driver	Identical
BASIS	AF IC	Slightly modified operational voltages

In the following explanations "L" and "H" are used to indicate binary state. In all cases "L" is ground (earth) potential.

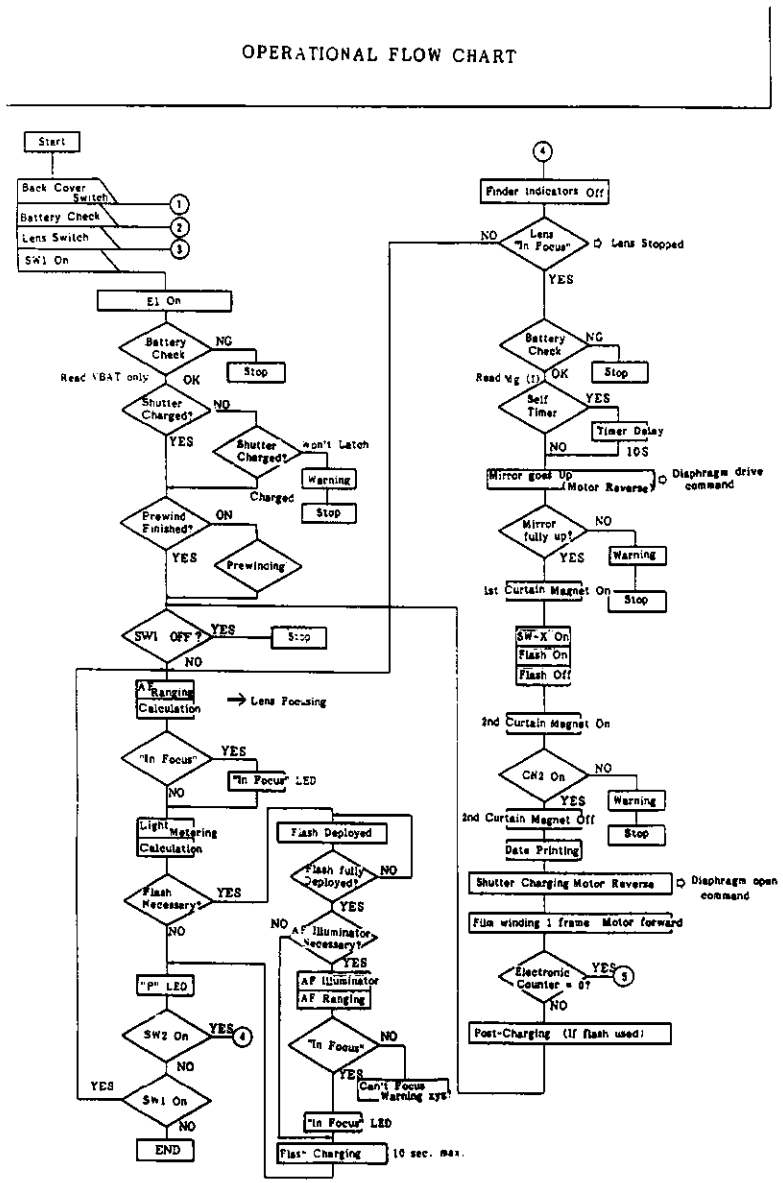
As an operational convenience, the overbar ($\overline{XXXX}$) normally used to indicate an "active low" condition is replaced by a slash (/).

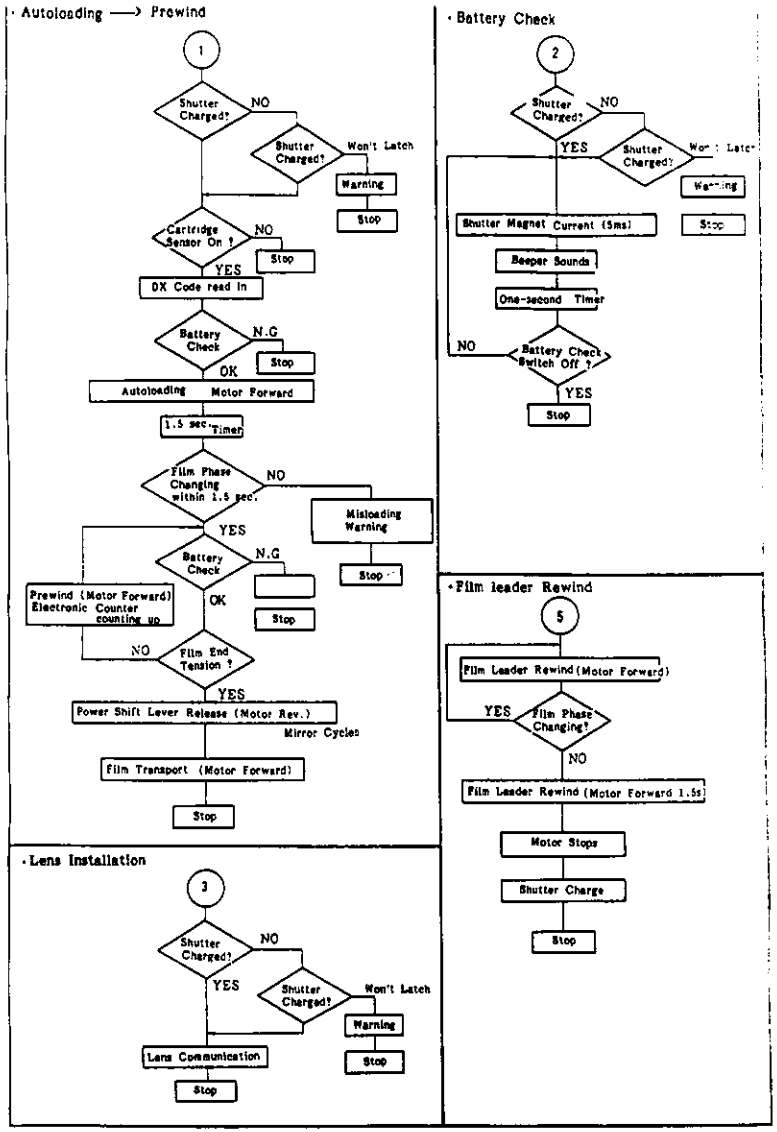
Ex: $\overline{E1ON}$ is noted /E1ON.

BLOCK DIAGRAM



OPERATIONAL FLOW CHART





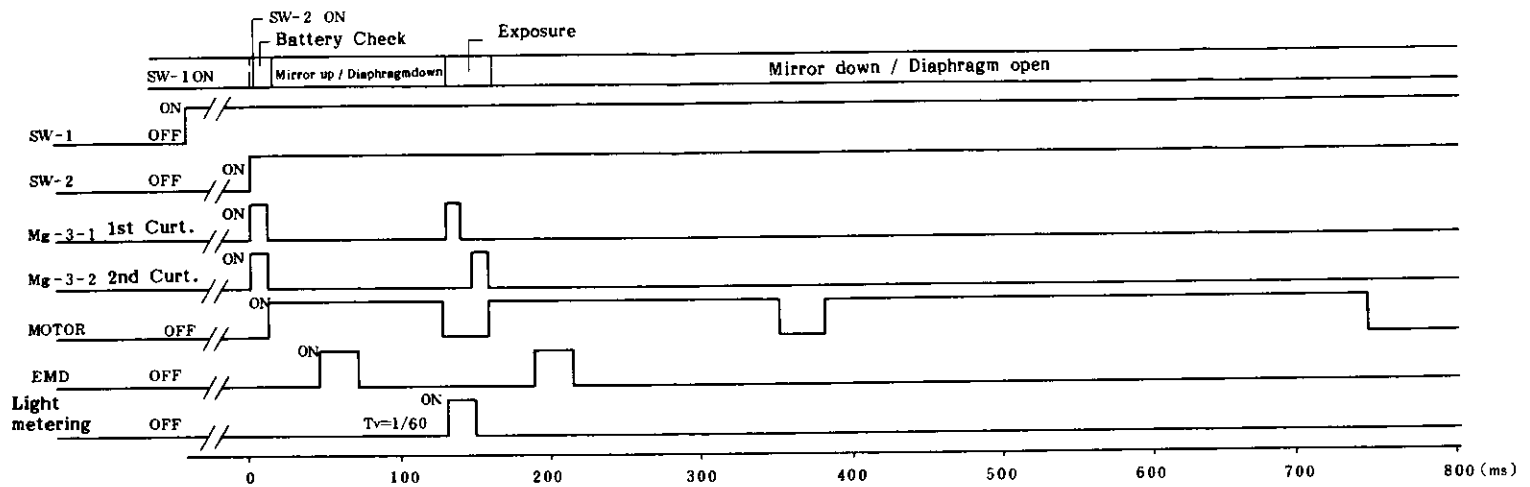
NORMAL OPERATION TIMING CHART (Nominal)

Parameters:

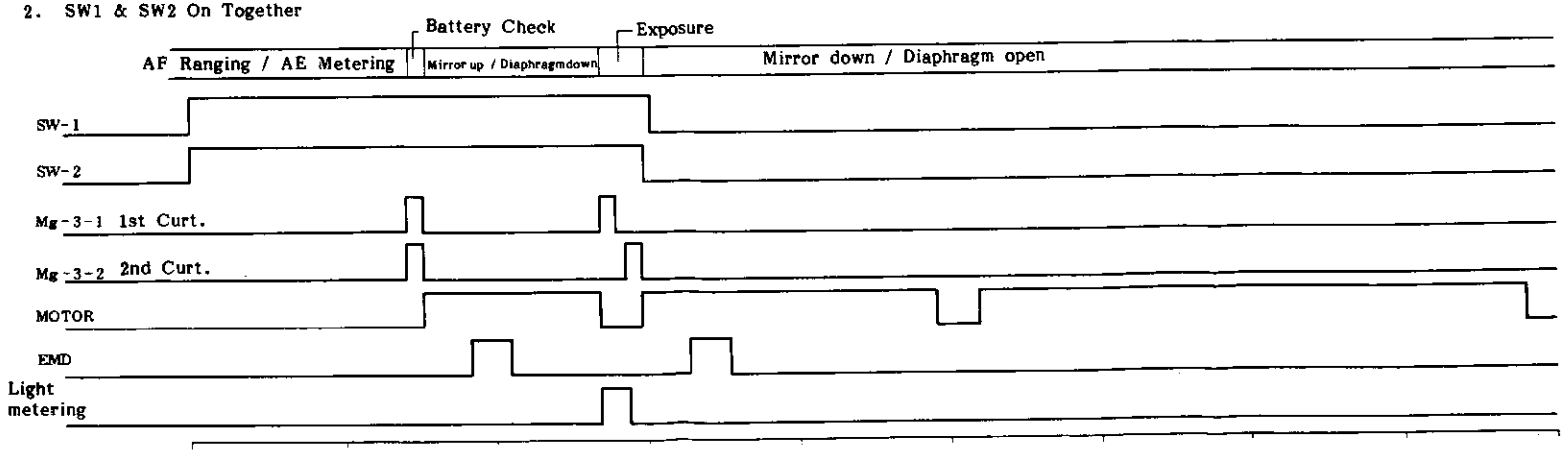
Camera: EOS 850
Lens: EF 50mm f/1.8
Aperture: about f/5.6
Power Supply: 5V
Misc. No flash

If SW 1 and SW 2 are pressed simultaneously the battery check timelag is 100ms in manual focus and 140ms in autofocus at EV13-14.

1. SW1 On, AF/AE finished, SW2 On



2. SW1 & SW2 On Together



CIRCUIT EXPLANATIONS

1. Power Supply

The power supply can be divided into three main sections.

1. Direct Battery Power

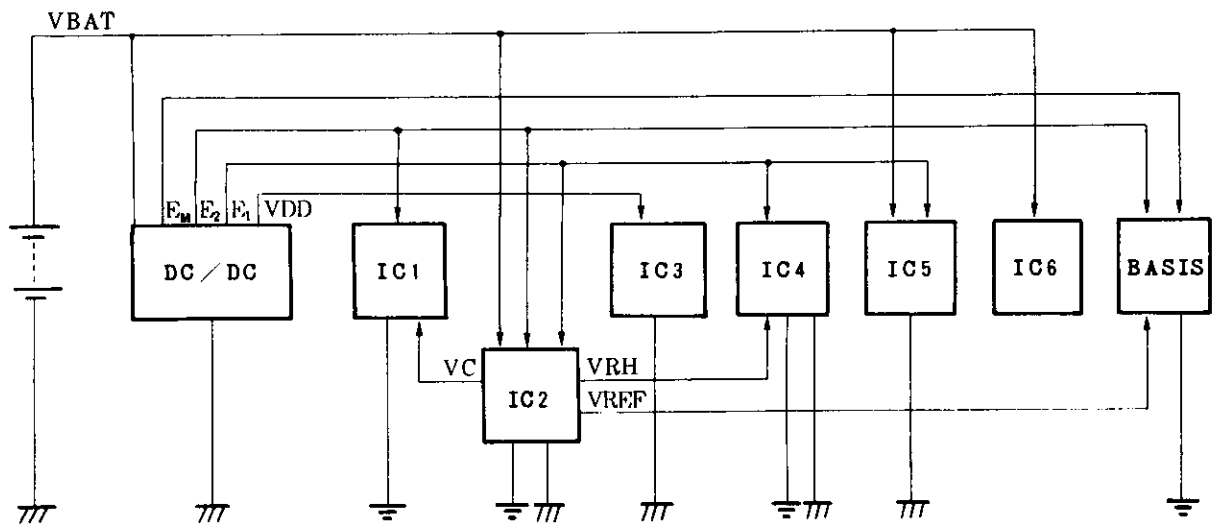
VBAT	-------	Power directly from battery.
VDD	-------	Battery voltage after passing through a reverse current prevention diode.
SVBAT	-----	Flash Power Supply (6 V)

2. DC/DC Convertor Power

E1	-------	IC Drive Voltage (5.5V)
E2	-------	Analog Circuits Voltage (5.5V)
EM	-------	BASIC Drive Voltage (-2.0V)

3. IC2 Generated Voltages

VC	-------	Camera Reference Voltage (1.22V)
VRH	------	IC4 A/D Conversion Reference Voltage (3.2V)
VREF	-----	BASIS Reference Voltage (1.9V)



: Analog ground (Earth)

: Digital ground (Earth)

SHUTTER BUTTON PRESSED HALFWAY (SW1 On)

E1 On

1. When SW1 turns on, E1On of the DC-DC convertor goes "L" and E1 and EM are generated.

2. E1 is supplied to IC2, IC4, and IC5.

3. IC2 monitors E1 and if it is over 4.2V, the reset signal (RES2) "L" is sent to IC4.

4. When IC4 gets the RES2 "L" , the internal program starts.

5. With IC4 program in operation, CSIO A-C (p10-12), SCLK, DMS, and DSM (p51-53) start communicating with IC2; /E1ON, already being "L" is held "L" .

6. Next, switch conditions are checked. Since SW1 is on, p64 of IC4 is "L".

Battery Check

An open circuit batter check is performed; Inhibit voltage = 4.0V.

7. CSIOA-C, SCLK, DMS, & DSM communicate with IC2 p56 (AD) and request a VBAT output.

8. The A/D convertor in IC4 takes the VBAT output, digitizes it and determines if the analog value is 4.0V or over.

Low Voltage

CSIOA-C, SCLK, DMS, & DSM communicate with IC2 and order /E1ON to go "H", cutting the power and stopping the camera.

Shutter Charged

By checking the shutter phase switches, the shutter condition (charged is the initial condition) is checked.

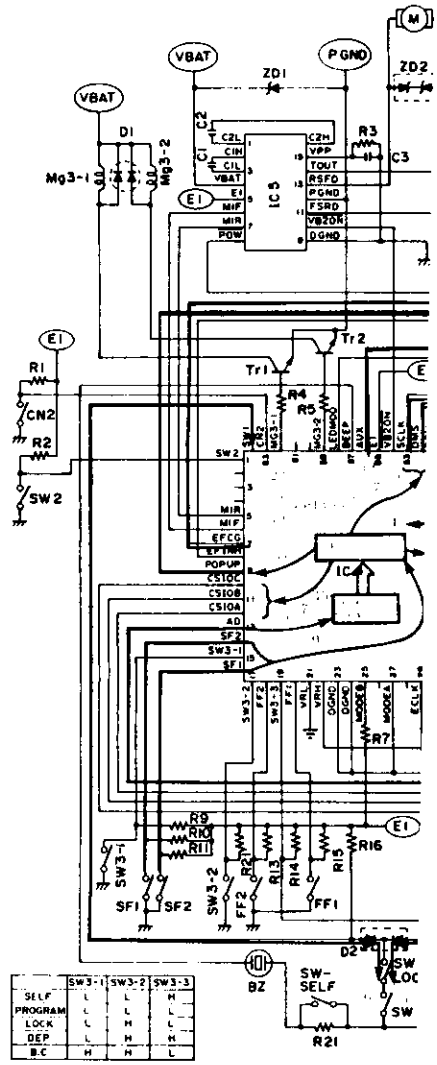
9. Shutter Phase Switches (SF1 & SF2) initial (charged) condition.

   SF1 ——> "L"
   SF2 ——> "H"

   If the condition is wrong, the shutter is charged again.

Prewind

If the battery expires during prewind, the condition is memorized by IC4 and prewind continues when the new battery is installed.



AF Operation

BASIS ——> Lens ——> "In Focus

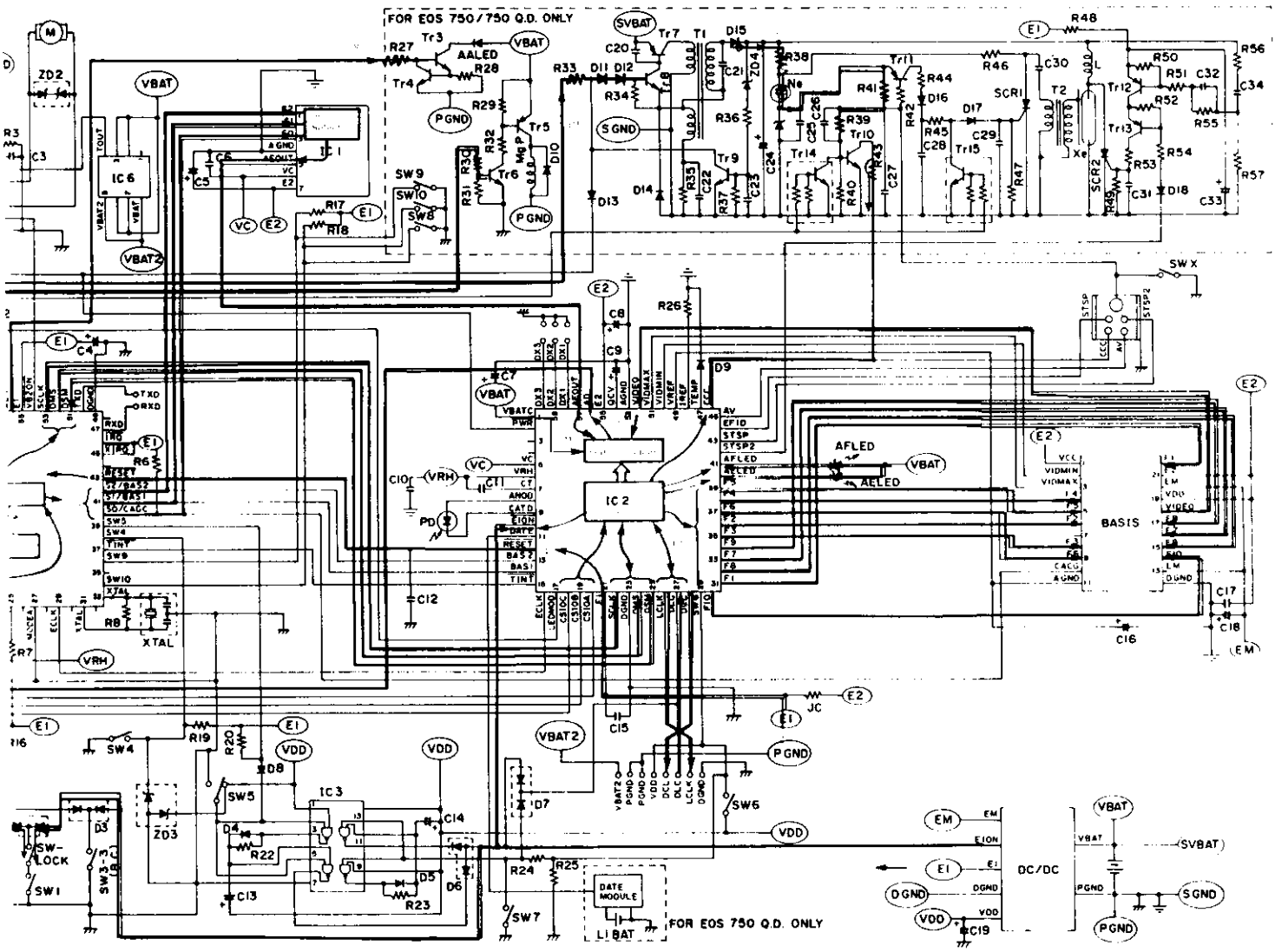
No ——> Yes ——> Stop

10. The Basis drive command is sent through SCLK, DMS, & DSM from IC4 to IC2.

11. The video signal output from BASIS is converted to digital within IC2 and sent to IC4 where it becomes the lens drive signal.

12. This signal is returned to IC2 through SCLK, DMS, & DSM and from IC2 to the lens to focus the lens.

13. When the "In Focus" signal is issued, it is sent through SCLK, DMS, & DSM to IC2 to light the AFLED.



AE Operation

14. IC4 sends signals on S0-3 (p40-42) to IC1 (metering IC) to read out the six areas in sequence on AEOUT to IC2.

15. IC4 then commands IC2 (through CSIOA-C, SCLK, DMS, & DSM) to select AEOUT which is sent through AD to IC4's A/D Convertor and the output of the six areas is digitized in turn.

16. When completed, IC4 send the command through SCLK, DMS, & DSM to light the AELED ("P").

AF and AE operations are repeated until the "In Focus" signal is output.

Low Light, Low Contrast, or Backlight (EOS 750)

Flash Up ⟶ AF Illum ⟶ Charge

17. Under the above adverse lighting conditions, IC4 p9 (POPUP) goes "H" turning on Tr5 and Tr6 energizing the flash magnet MgP.

18. If "In Focus" was not achieved on the previous attempt IC4's AUX (p56) goes "H" turning on Tr3 and Tr4 activating the AF Illuminator LED (AALED). At the same time AF ranging (Steps 10, 11, & 12) takes place.

19. If "In Focus" is achieved, IC4 p7 (EFCG) goes "H" and charging starts.

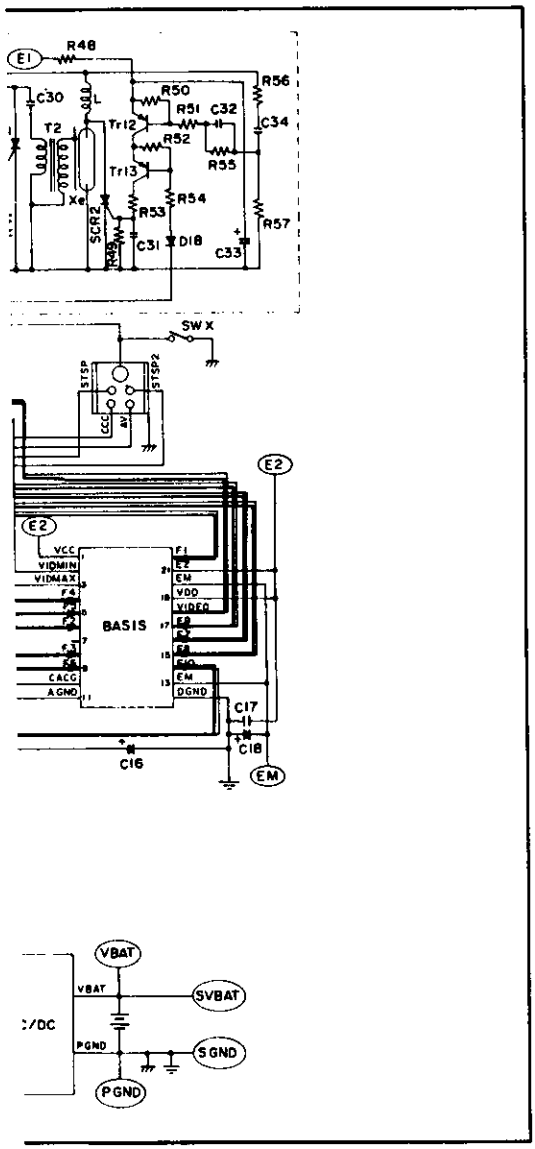
20. When the charge reaches 260V, lights, allowin through R41 an Tr10.

21. Approximately through Tr10 an p46 (CCC).

22. This fact is com SCLK, DMS & I

23. IC4 in turn com SCLK, DMS & AE LED.

Note: If incomplet continue for after SW1 stopping. If the shutter w



20. When the charge on capacitor C24 reaches 260V, the neon lamp lights, allowing current flow through R41 and R39 turning on Tr10.

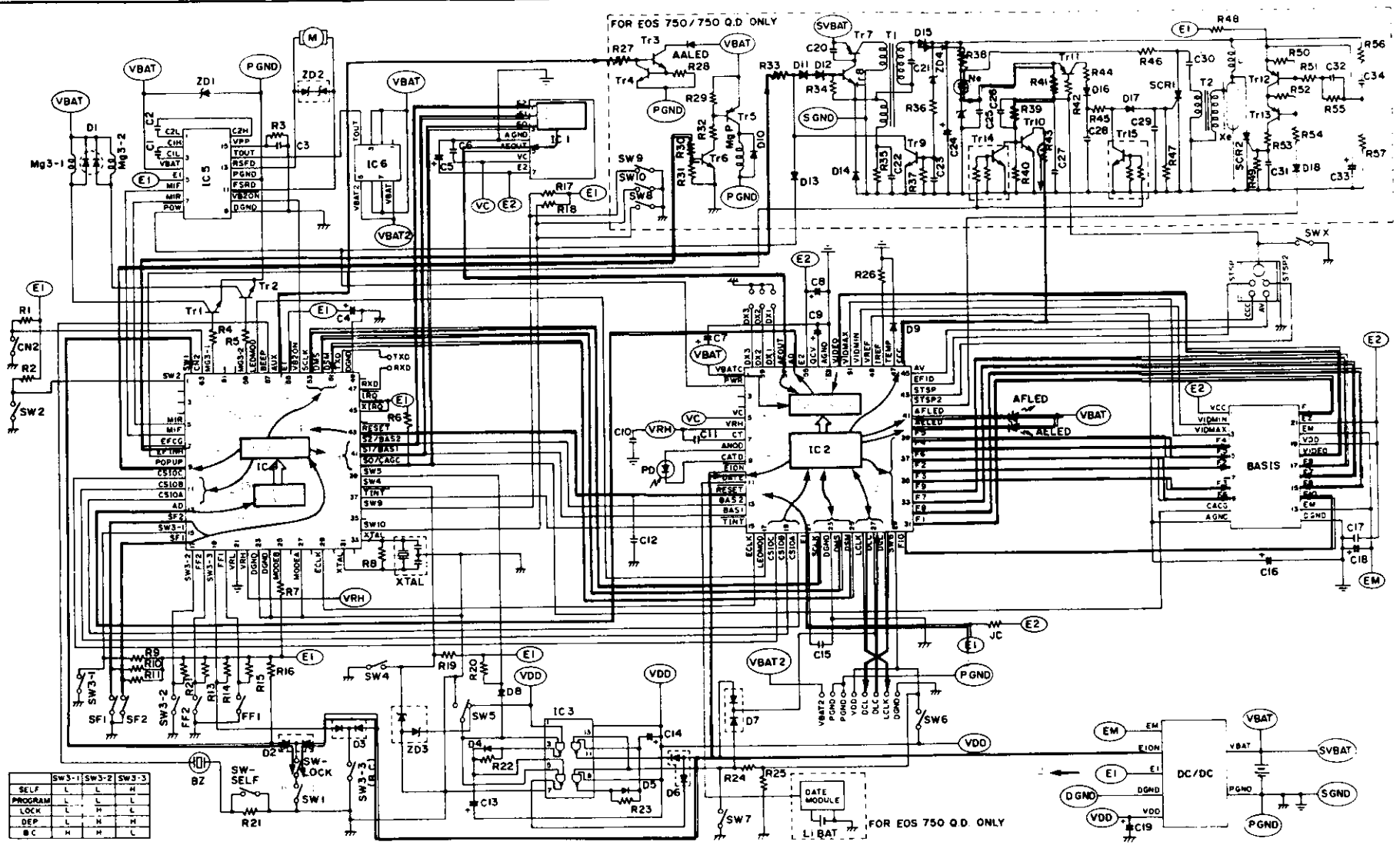
21. Approximately 300uA flows through Tr10 and R43 to the IC2 p46 (CCC).

22. This fact is communicated through SCLK, DMS & DSM to IC4.

23. IC4 in turn commands IC2 through SCLK, DMS & DSM to light the AE LED.

Note: If incomplete, charging will continue for up to ten seconds after SW1 goes off before stopping. If still incomplete, the shutter will not release.

(SW1 On)


FOR EOS 750/750 Q.D ONLY
FOR EOS 750 Q.D ONLY
VBAT
PGND
SGND
SVBAT
VBAT2
VDD
VRH
VC
E1
E2
EM
IC1
IC2
IC3
IC5
IC6
Tr1
Tr2
Tr3
Tr4
Tr5
Tr6
Tr7
Tr9
Tr10
Tr11
Tr12
Tr13
Tr14
Tr15
AALED
AFLED
BASIS
DC/DC
XTAL
SW-SELF
SW-LOCK
DATE MODULE
LI BAT
SW1
SW2
SW3-1
SW3-2
SW3-3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SWX
BZ
SF1
SF2
FF1
FF2
SCR1
SCR2
Xe
Ne
JC
CN2
Mg3-1
Mg3-2
TXD
RXD
SCLK
VBTON
VPP
RSFD
FSRD
DGND
AGND
VIDEO
VIDMIN
VIDMAX
VREF
TEMP
EFID
STSP
STSP2
AFLED
AELED
EION
DGND
VDD
PGND
SGND
SVBAT
VBAT
VBAT2
EM
E1
E2
VC
VRH
SW-SELF
SW-LOCK
SW3-1
SW3-2
SW3-3
SELF
PROGRAM
LOCK
DEP
B C

SHUTTER BUTTON PRESSED FULLY (SW2 On)

Lens "In Focus"

1. When SW2 turns on, IC4 p1 goes "L" and determines if the lens is "In Focus".

If not, AF and AE operations are repeated until the "In Focus" signal is output. (See preceding diagram)

Finder Information Off

2. When "In Focus", IC4 commands IC2 to turn off the viewfinder LEDs. (Comm.: SCLK, DMS & DSM)

Battery Check

3. IC4 p62 (Mg3-1) and p59 (Mg3-2) go "H" turning Tr1 & Tr2 on so current flows through the magnets checking the battery under load.

4. Through CSIOA-C, SCLK, DMS, & DSM, IC4 commands IC2 to select VBAT output.

5. The A/D convertor in IC4 takes the VBAT output, digitizes it and determines if the analog value is 4.0V or over.

Low Voltage

CSIOA-C, SCLK, DMS, & DSM communicate with IC2 and order /E1ON to go "H", cutting the power and stopping the camera.

Self Timer

If the selector dial is set to SELF, the beeper will beep at 2Hz for eight seconds and 8Hz for two seconds before the sequence continues.

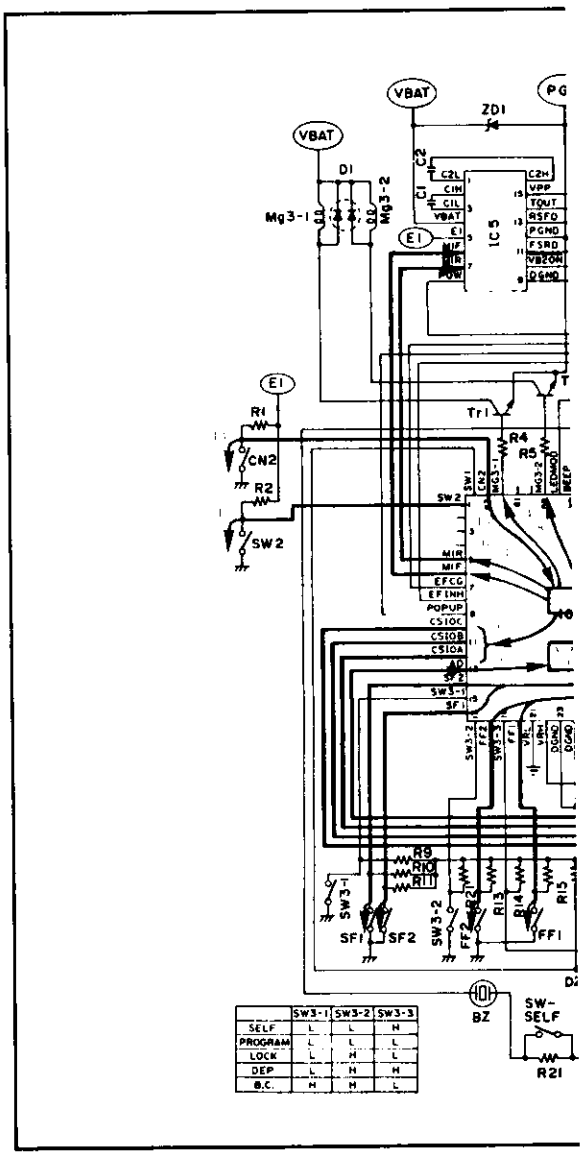
Mirror Up

6. IC4 p5 (M1R) goes high and is input to IC5 p7. This causes the motor to turn in the reverse direction.

7. Shutter Phase Switches (SF1 & SF2) condition is monitored. When --

   SF1 ⟶ "H"
   SF2 ⟶ "L"

   -- the brake is applied.



First Curtain Run

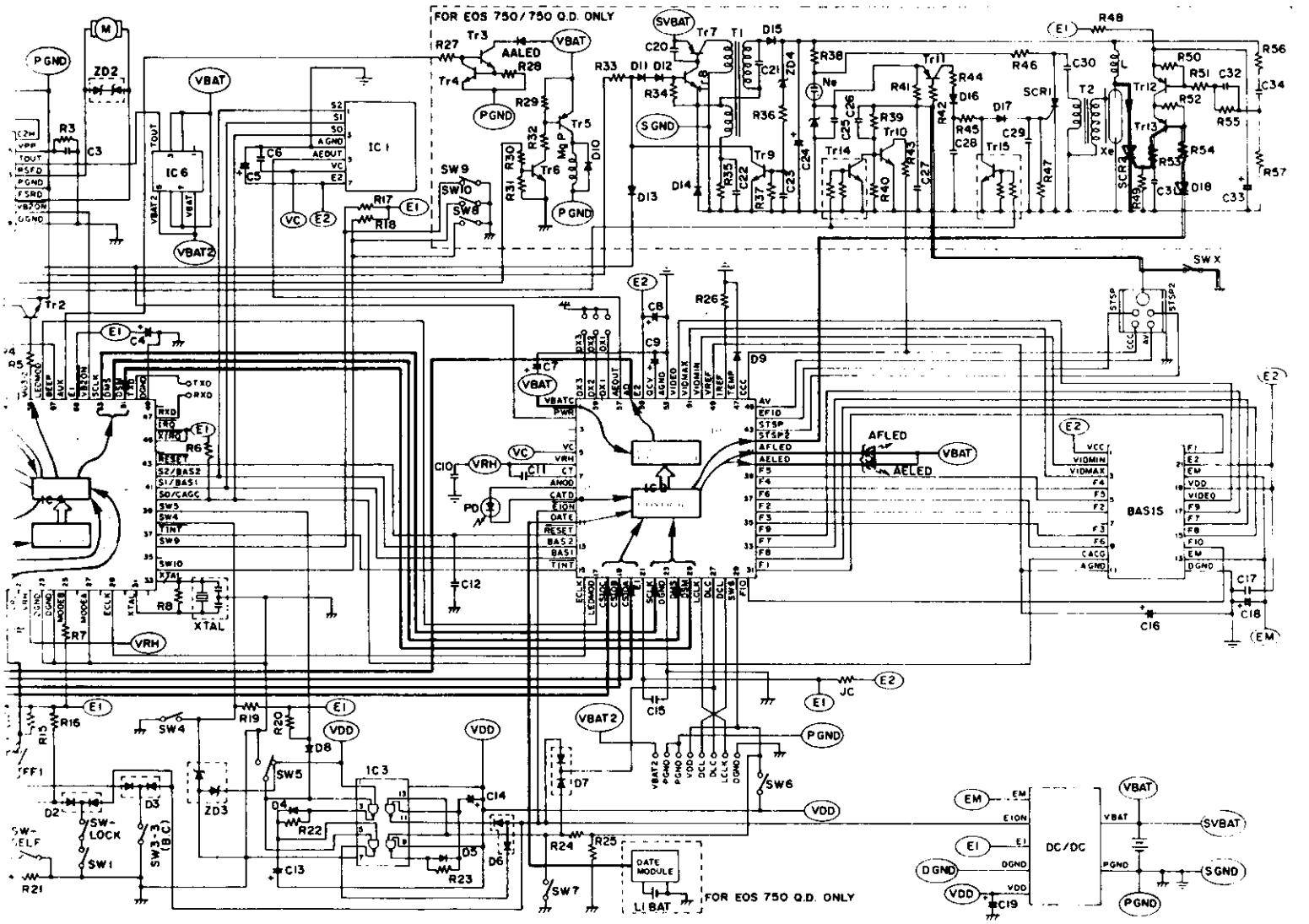
8. IC4 p62 (Mg3-1) goes "H" turning Tr1 on releasing the 1st Curtain.

Flash Operation

9. When the X sync closes (SW-X), Tr11 is turned on, turning SCR2 on and the flash fires.

10. When proper flash exposure is reached, IC2 p42 (SPSP2) goes low turning Tr13 on.

11. Turning Tr13 on gates SCR2 on, dumping the remaining charge.



Second Curtain Run

12. At the end of the exposure time, IC4 p59 (Mg3-2) goes "H" turning Tr2 on releasing the 2nd curtain.

13. When the 2nd curtain switch (CN2) goes on p59 goes "L" stopping the magnet current. (If over 20ms elapse and CN2 remains off, the current is stopped.)

Date Printing

14. IC4 then commands IC2 (through CSIOA-C, SCLK, DMS, & DSM) to ground DATE (p10) triggering the date module.

Shutter Charge

15. To charge the shutter, IC4 p5 (M1R) signals IC5 to turn the motor in reverse.

16. Shutter Phase Switches (SF1 & SF2) condition is monitored. When --

    SF1 ——> "L"
    SF2 ——> "H"

    -- the brake is applied.

Film Winding

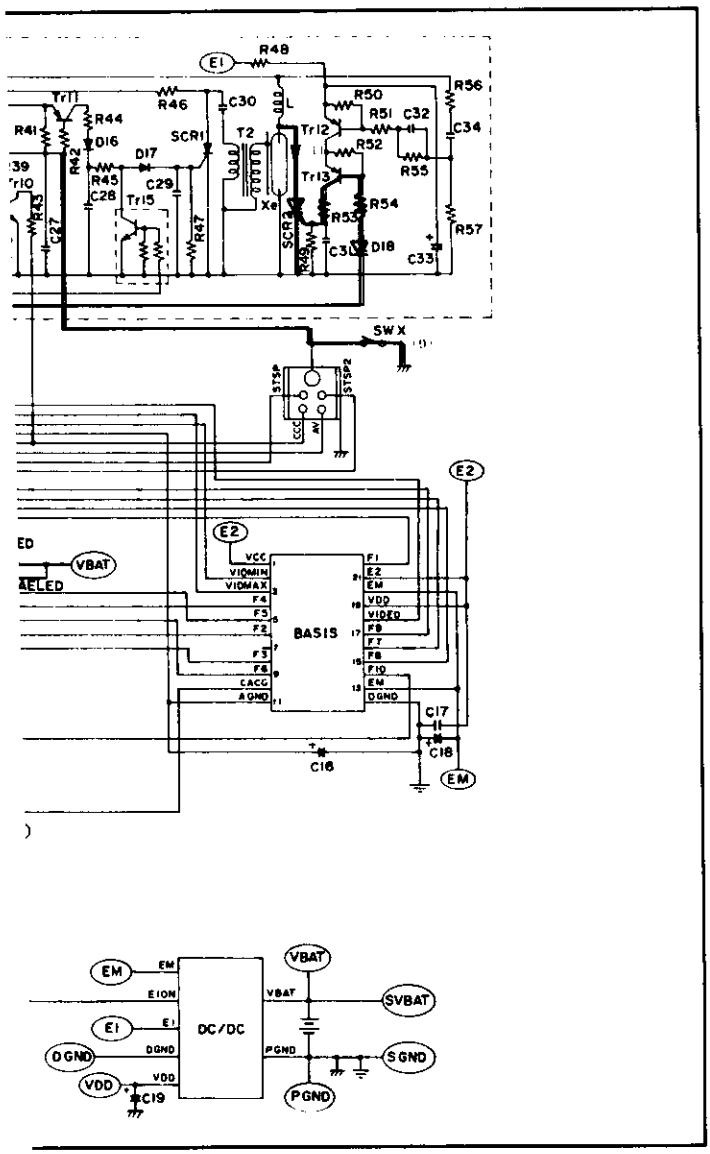
17. To wind one frame IC4 p6 (M1 goes "H" turning the motor fc ward.

18. Film Phase (FF1 & FF2) is mor tored and the motor brake appli when one frame has been woun

Flash Post-Charge

If flash was used, the capacitor partially charged to prepare for t next exposure.

See "SW1 On, paragraphs 19 throu 22 for the sequence.



Film Winding

17. To wind one frame IC4 p6 (M1F) goes "H" turning the motor forward.

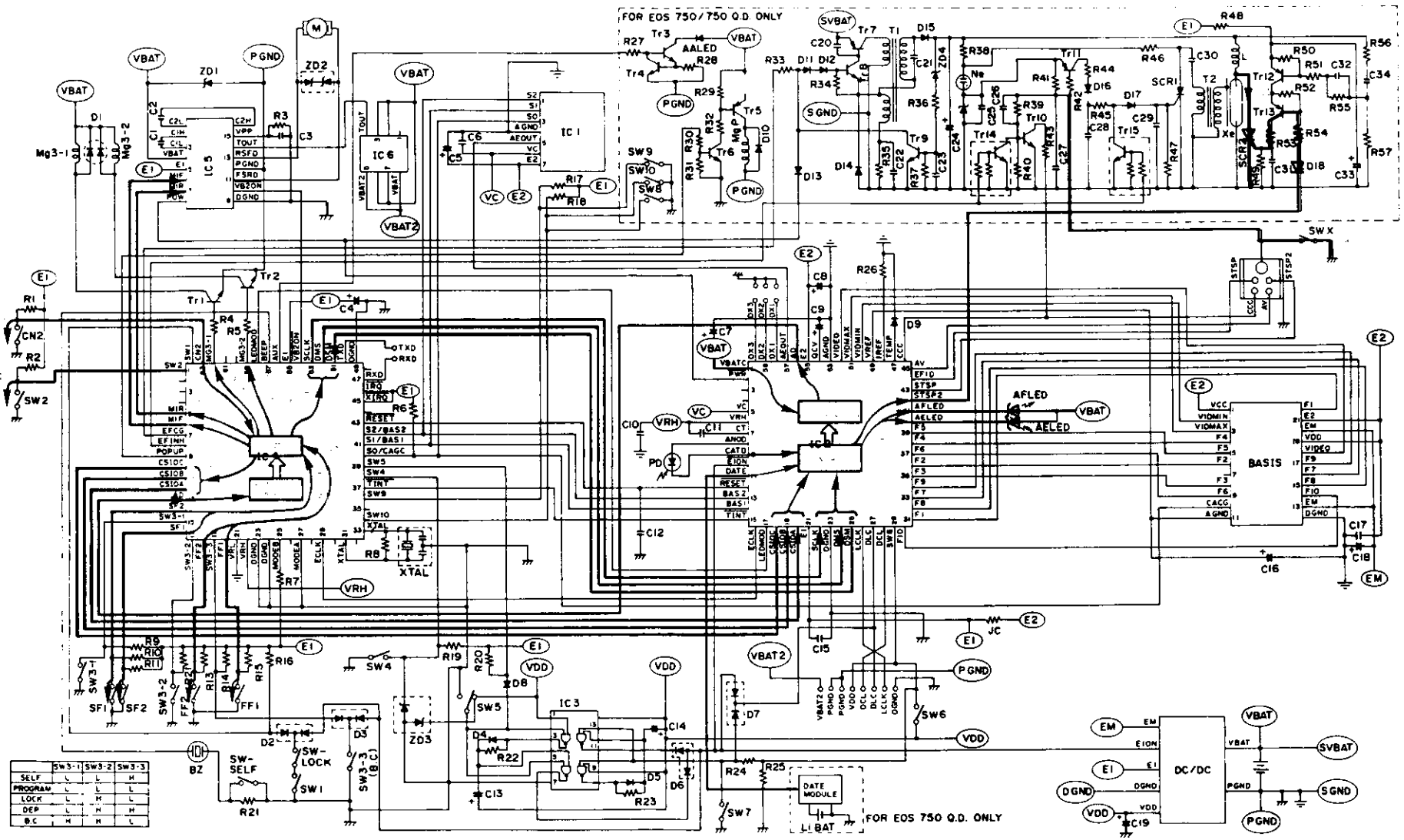
18. Film Phase (FF1 & FF2) is monitored and the motor brake applied when one frame has been wound.

Flash Post-Charge

If flash was used, the capacitor is partially charged to prepare for the next exposure.

See "SW1 On, paragraphs 19 through 22 for the sequence.

(SW2 On)


FOR EOS 750/750 Q.D. ONLY
FOR EOS 750 Q.D. ONLY
DC/DC
BASIS
DATE MODULE
Li BAT
SW-SELF
SW-LOCK
SW3-3 (B.C)
SELF
PROGRAM
LOCK
DEP
B.C
VBAT
PGND
SVBAT
SGND
VDD
DGND
VRH
VBAT2
XTAL
BZ
SW X

AUTOLOADING and PREWIND

E1 On

1. When the back cover is closed, SW5 closes causing IC3 p2 & 5 to go "L".

2. IC3, R22 and C13 comprise a monostable multivibrator which pulls down IC3 p6 to "L" for about 150ms.

3. This causes /E1ON of the DC-DC convertor to go "L" and E1 and EM are generated. E1 is supplied to IC2, IC4, and IC5.

4. IC2 monitors E1 and if it is over 4.2V, the reset signal (RES2) "L" is sent to IC4.

5. When IC4 gets the RES2 "L" , the internal program starts.

6. With IC4 program in operation, CSIO A-C (p10-12), SCLK, DMS, and DSM (p51-53) start communicating with IC2; /E1ON, already being "L" is held "L" .

7. Next, switch conditions are checked. Since the back cover switch SW5 is closed, p39 of IC4 is "L".

Shutter Charged

By checking the shutter phase switches, the shutter condition (charged is the initial condition) is checked.

8. Shutter Phase Switches (SF1 & SF2) initial (charged) condition.

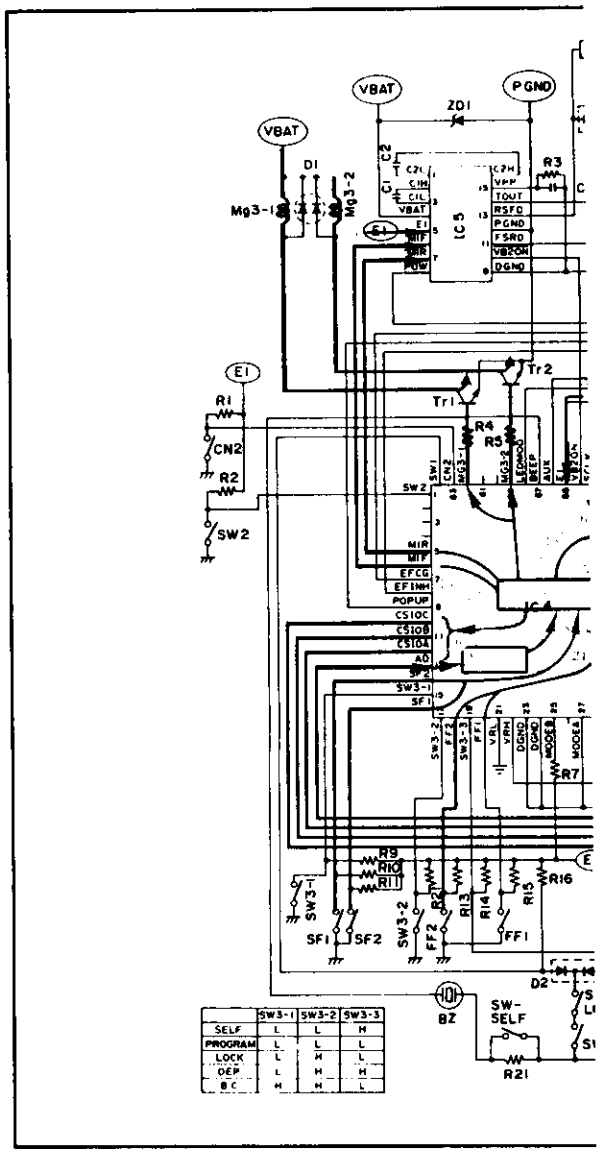
   SF1 ——> "L"
   SF2 ——> "H"

   If the condition is wrong, the shutter is charged again.

Cartridge Switch Condition

9. The cartridge switch (SW4) is checked. If it is on it is "L".

   If it is not on, CSIOA-C, SCLK, DMS, & DSM communicate with IC2 and order /E1ON to go "H", cutting the power and stopping the camera.



DX Code Reading

10. IC4 commands IC2 (through CSIOA-C, SCLK, DMS, & DSM) to select DX.

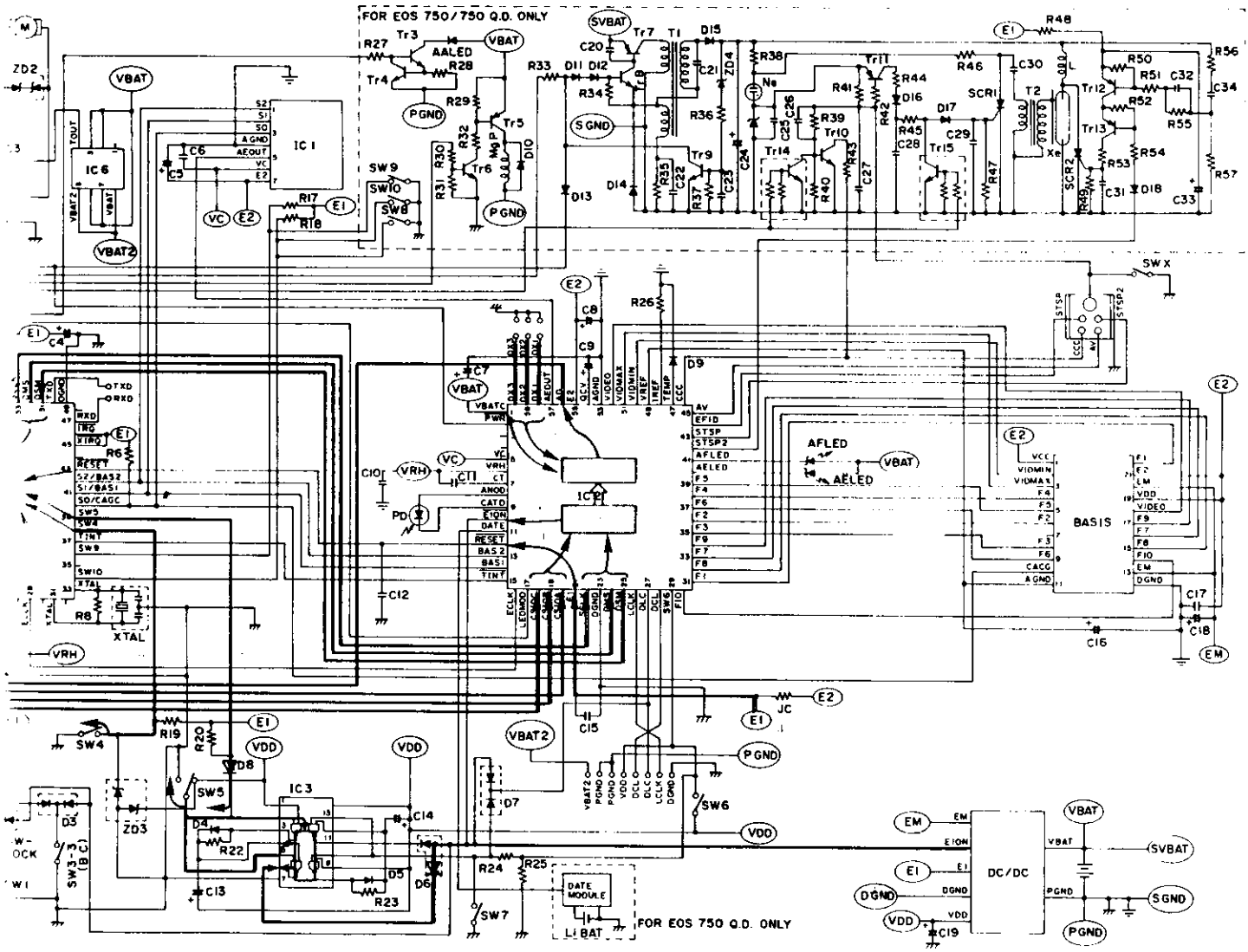
11. The DX signal is sent through AD to IC4's A/D Convertor and the output is digitized to determine the film speed (ISO).

Battery Check

12. IC4 p62 (Mg3-1) and p59 (Mg3-2) go "H" turning Tr1 & Tr2 on so current flows through the magnets checking the battery under load.

13. Through CSIOA-C, SCLK, DMS, & DSM, IC4 commands IC2 to select VBAT output.

14. The A/D convertor in IC4 takes the VBAT output, digitizes it and determines if the analog value is 4.0V or over.



Low Voltage

CSIOA-C, SCLK, DMS, & DSM communicate with IC2 and order /E1ON to go "H", cutting the power and stopping the camera.

Prewind

15. To wind the film, IC4 p6 (M1F) goes "H" driving the motor in the forward direction.

16. The film is wound initially for 1.5 seconds and then continues provided a film phase shift is detected within 1.5 seconds (FF1 && FF2 are the film phase switches).

Misloading: If a phase shift is not detected, the beeper beeps for four seconds at 8Hz and the camera turns off.

Battery Check

17. IC4, (through CSIOA-C, SCLK, DMS, & DSM) communicates with IC2 p56 (AD) and request a VBAT output.

18. The A/D convertor in IC4 takes the VBAT output, digitizes it and determines if the analog value is 4.0V or over.

Low Voltage

If the voltage is below 4.0V, the beeper beeps for four seconds at 8Hz and the camera turns off.

Film End Tension Sensing

19. During prewind, film phase shift is continuously monitored. If a shift does not occur within 300ms, the MPU determines film end. Until film end is determined, steps 16 through 19 repeat.

Power Shift Lever Release

20. To enable shutter charge (M1R) goes "H" turning i in reverse through IC5.

21. The shutter phase switc & SF2) are checked. W

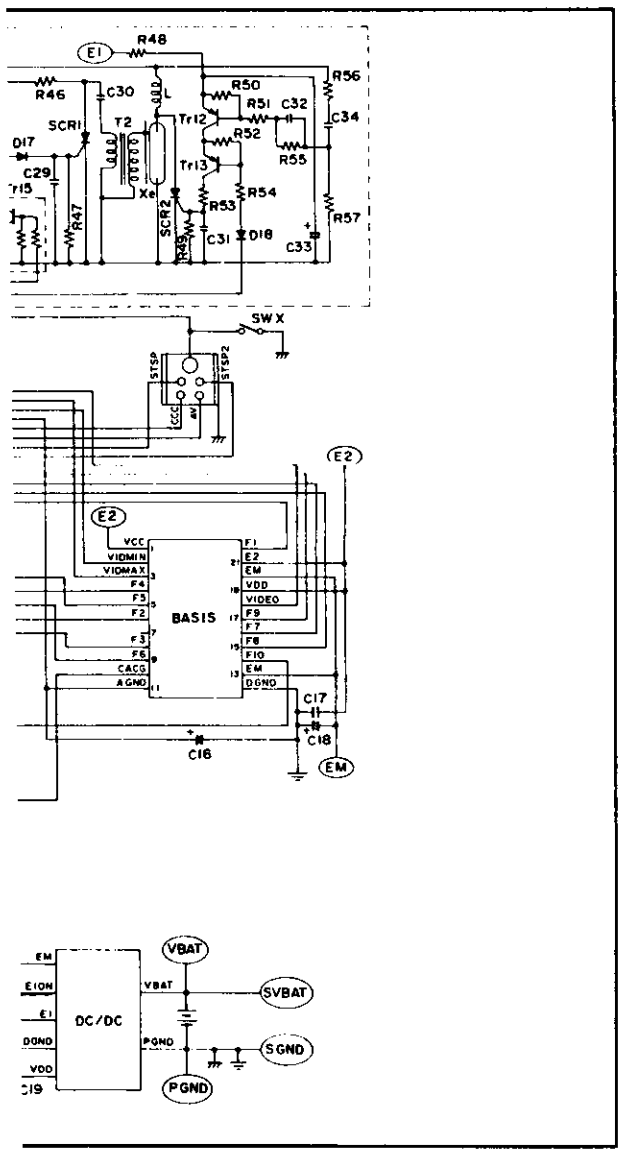
SF1 ——> "L"
SF2 ——> "H"

the motor brakes, the po lever is released, and th is in the initial charged

Film Frame Indexing

22. Next the film is wou slightly to establish th frame position. IC4 p6 ("H" turning the motor in ward direction.

23. The film phase shift is (FF1 & FF2) and stopp positioned properly.



Power Shift Lever Release

20. To enable shutter charge, IC4 p5 (M1R) goes "H" turning the motor in reverse through IC5.

21. The shutter phase switches (SF1 & SF2) are checked. When ---

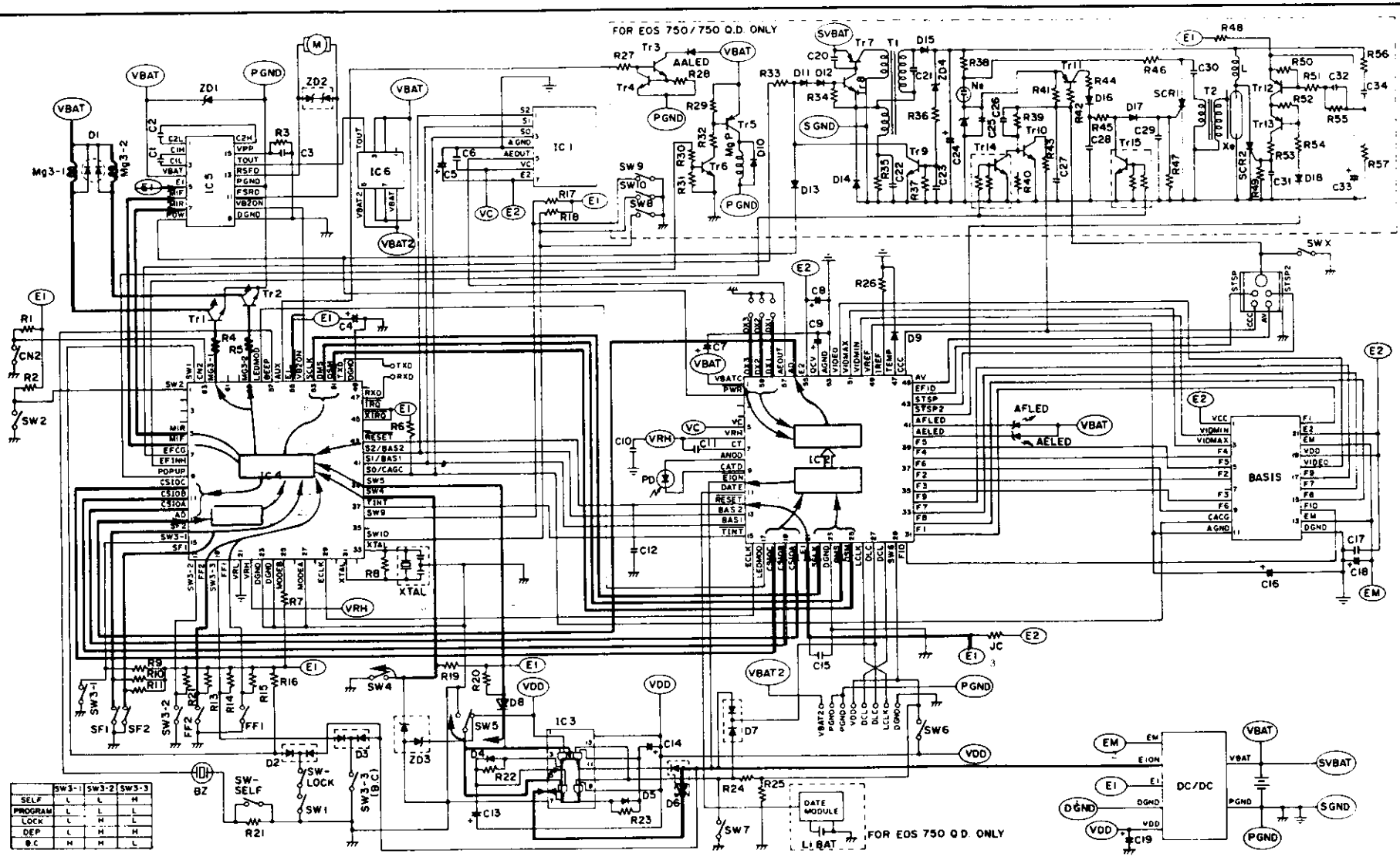
    SF1 ⟶ "L"
    SF2 ⟶ "H"

    the motor brakes, the power shift lever is released, and the shutter is in the initial charged condition.

Film Frame Indexing

22. Next the film is wound back slightly to establish the initial frame position. IC4 p6 (M1F) go "H" turning the motor in the forward direction.

23. The film phase shift is monitored (FF1 & FF2) and stopped when positioned properly.


FOR EOS 750/750 Q.D. ONLY
FOR EOS 750 Q.D. ONLY
VBAT
PGND
SVBAT
SGND
VBAT2
VDD
VRH
VC
E1
E2
EM
IC1
IC3
IC4
IC5
IC6
LCD
BASIS
DC/DC
DATE MODULE
LI BAT
XTAL
BZ
SW-SELF
SW-LOCK
SW1
SW2
SW3-1
SW3-2
SW3-3 (B.C)
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SWX
SF1
SF2
FF1
FF2
AFLED
AELED
Mg3-1
Mg3-2
Mg P
SCR1
SCR2
XTAL
CN2
JC
CI6
CI7
CI8
CI9
SW3-1 SW3-2 SW3-3
SELF L L H
PROGRAM L L L
LOCK L H L
DEP L H H
B.C H H L

5. Power Up

The first generation EOS 650 and 620 cameras had an LCD panel which required some power even when the camera was on "L". These second generation models (EOS 750, 750 QD, and 850) do not require continuous power. When any one of the following switches are activated, the DC-DC convertor is energized.

SW1	-----	Ranging / Metering Switch (Shutter Button $\frac{1}{2}$)
SW3-3	-----	Selector Dial to Battery Check
SW5	-----	Back Cover Switch
SW6	-----	Lens Switch

Principle:

1. When any one of theses switches is activated, the /E1ON pin on the DC-DC convertor goes "L" activating the DC-DC convertor.

2. IC2 and IC4 receive E1 from the DC-DC convertor.

3. IC2 monitors E1, and if it is 4.2V or over, IC4's /RESET pin goes "L".

4. This resets IC4 and the program goes into operation.

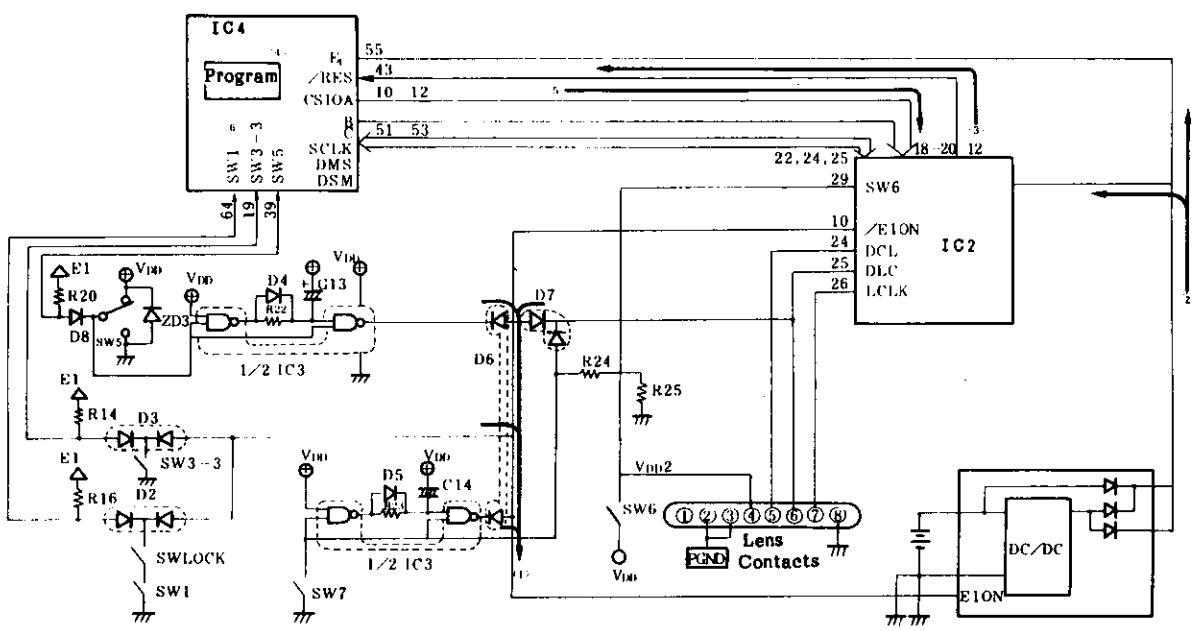
5. The program communicates with IC2 through CSIOA-C, SCLK, DMS, & DSM to hold /E1ON "L".

6. The program then initiates necessary action depending on which switch was activated.

---------- SW1 or SW3-3 On

1. When either switch is closed /E1ON is grounded directly so it is "L".

2. As stated above from step 2.



SW5 (Back Cover Switch)

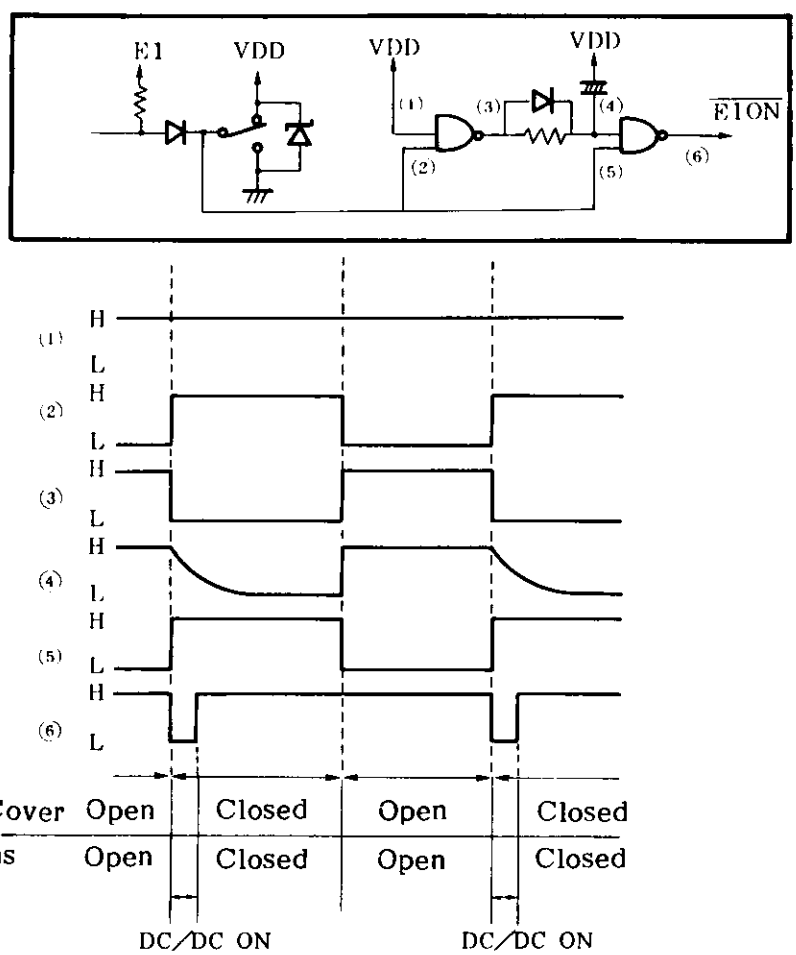
When the back cover is closed, /E1ON goes "L" and the DC-DC convertor is activated, but it will continue to draw current as long as it is left in this condition. A monostable multivibrator is used between the back cover switch and the DC-DC convertor so /E1ON returns to "H" 150ms after the back cover is closed.

SW6 (Lens Switch)

The lens has two power modes, Power and Stand-by. If the power is removed with the lens in the power mode, the lens will return to the power mode when the power is restored, causing unnecessary battery drain.

To prevent this, it is necessary to activate the microprocessor and have a communication sequence between the camera and lens. To accomplish this IC4 and IC2 must be turned on, so the monostable multivibrator is used to activate the DC-DC convertor for 150ms only.

Monostable Multivibrator



Misc. Whenever the lens' AF/M is changed, or an USM lens is used in manual focusing mode, the lens' LIN goes "L" to activate the DC-DC convertor.

6. Battery Check

This camera uses both no-load and loaded battery checks at different times.

(1) Loaded Battery Check -- Current flows through shutter magnets, and battery voltage read.

SW2 On	Current for 10ms
Manual Battery Check*	Current for 50ms
Autoloading ——> Prewind	Current for 10ms

(2) No-load Battery Check -- Open circuit battery voltage measured.

SW1 On

During prewind

*: Manual Battery Check

Current flows through shutter magnets for 50ms and the battery voltage is read. Depending on the voltage, the beeper sounds. Adjustment is electronic, using EOS TOOL.

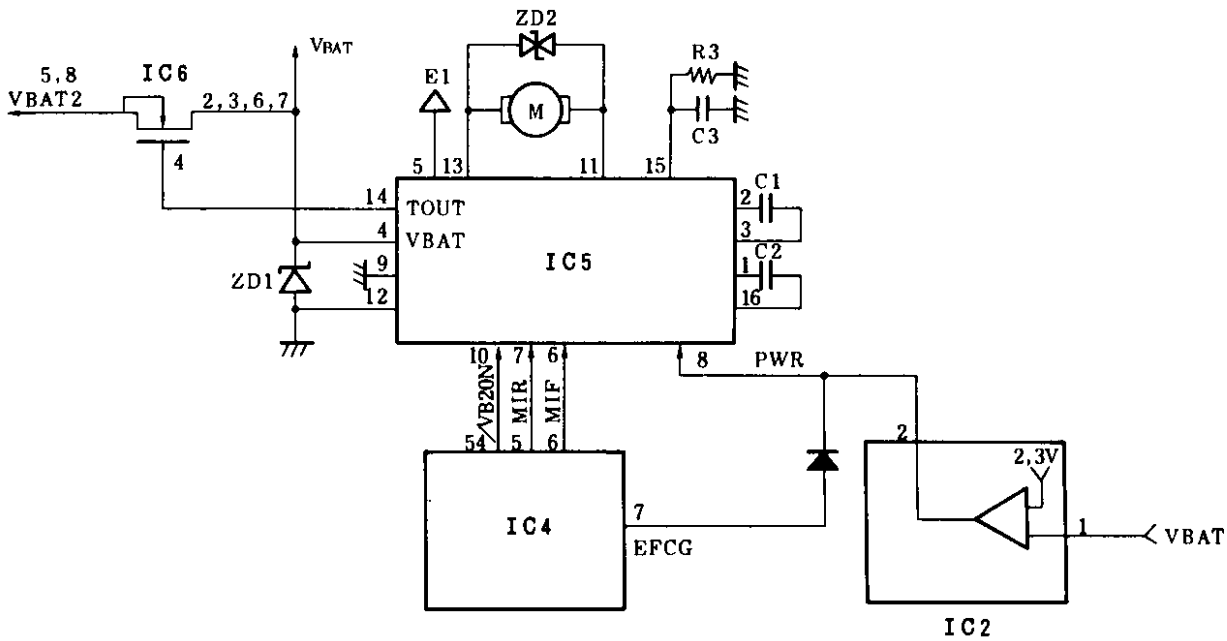
Voltage	Beeper
5.2V or over	8Hz
4.9 to 5.2V	2Hz
Below 4.9V	No beeping

Below 3.8V, no current flows through the magnets. The shutter inhibit voltage is 4.0V.

7. Motor Drive and VBAT2 Generation

IC5 is the motor driver, and it also generates VBAT2 for the lens.

Principle: IC5 cannot operate unless /PWR is "H". /PWR does not go high unless VBAT is 2.3V or greater.



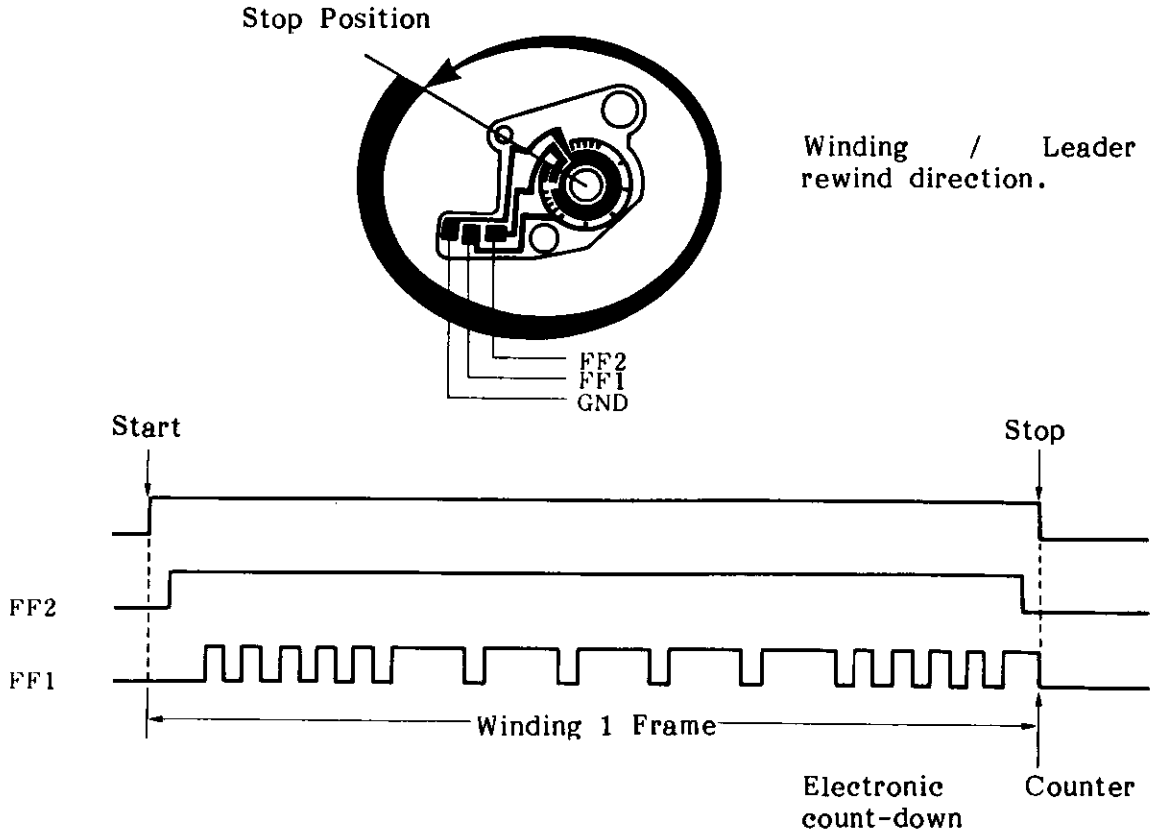
Motor Drive — The motor drive is controlled by the output from IC4 p5 and 6 (M1R & M1F). The control of motor forward and reverse rotation and braking are as follows.

	M1R	M1F
Foward	0	1
Reverse	1	0
Braking	1	1

VBAT2 — When IC4 p54 (VB2ON) goes "H", TOUT goes high turning IC6 on. To drive IC6 a high voltage VPP (14V) is generated within IC5 and applied to TOUT.

Film Phase Switches

Film Phase Switches FF1 and FF1 sense film movement and control the film transport system. The switch contact board is laid out as shown.



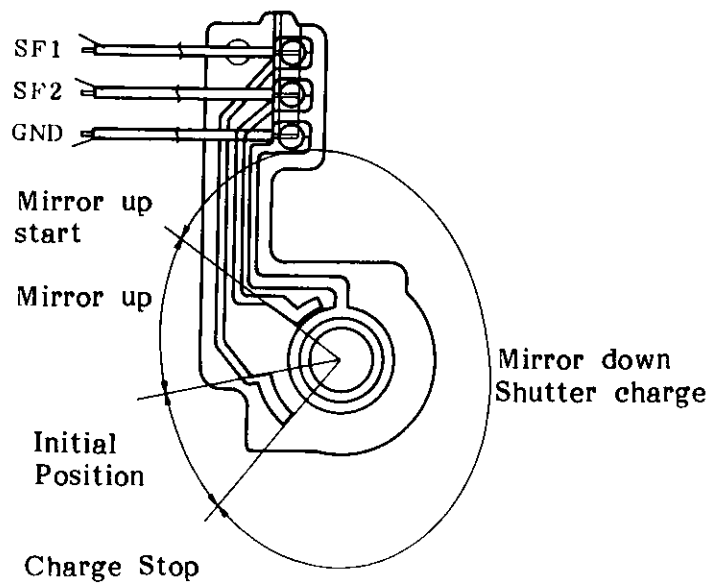
Autoloading / Prewind

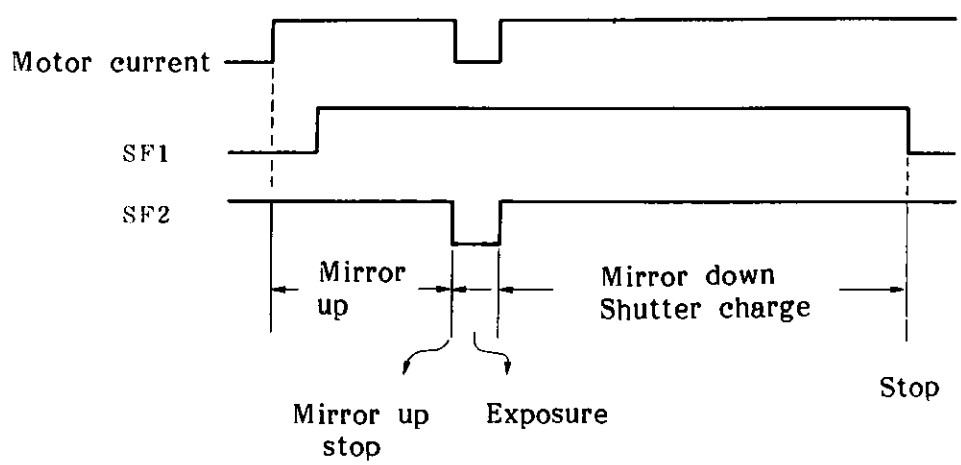
When the back cover is closed, the film is wound for 1.5 seconds, and wound another 1.5 seconds while checking for film phase shift indicated by a condition change of FF1 and FF2. When the phase shift is sensed, the electronic counter counts up.

When the end of film tension is felt, the motor turns in the forward direction (the power shift lever switches the the reverse direction) and when FF1 and FF2 both go "H" the motor stops and the camera is set for taking the first frame.

Shutter Phase Switches

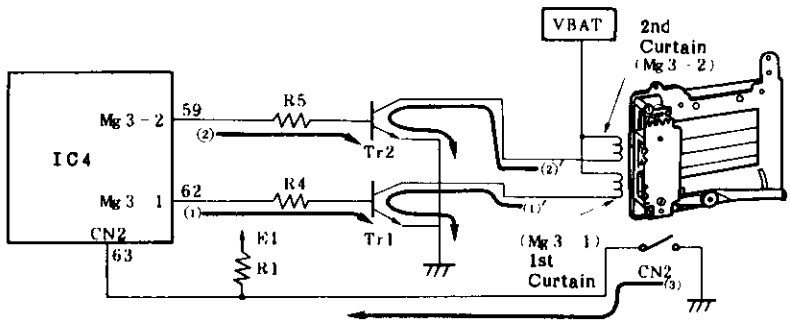
Shutter Phase Switches SF1 and SF2 control shutter charging and mirror operation.





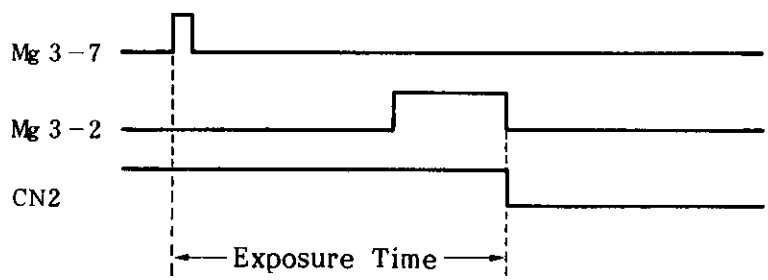
8. Shutter Operation

Shutter exposure operation is controlled by IC4.



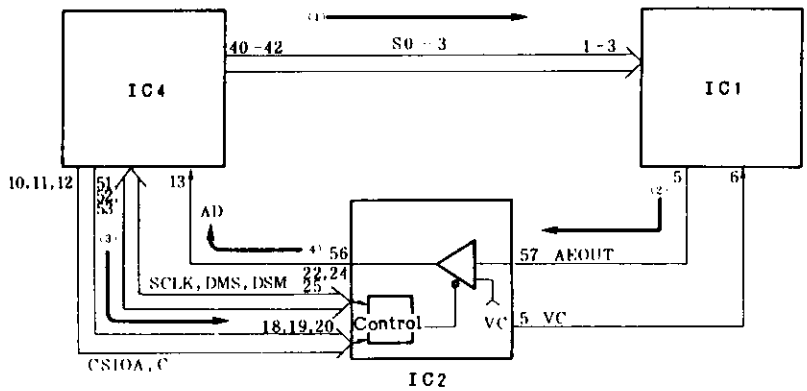
First Curtain: When the mirror completes its upward travel, the 1st curtain drive signal (Mg3-1) goes "H" turning on Tr1 and current flows through the magnet Mg3-1 coil for 8ms. There is no 1st curtain finished signal.

Second Curtain: When the exposure time is finished, the 2nd curtain drive signal (Mg3-2) goes "H" , turning on Tr2 so current flows through Mg3-2 coil. Mg3-2 stays on until CN2 closes "L", except if CN2 does not go "L" within 20ms. In this case Tr2 turns off and the warning beeper turns (8Hz).



9. Light Metering

The six-section IC (IC1) used in the EOS 650/620 is used.



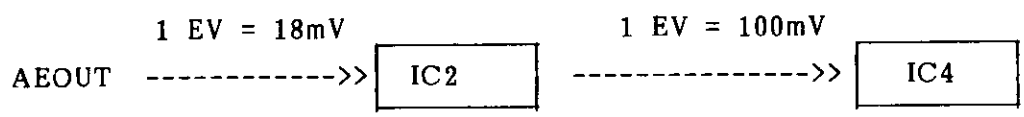
Principle:

1. IC4 sends signals on S0-3 (p40-42) to IC1 (metering IC) to read out the six areas in sequence on AEOUT to IC2.

2. IC4 then commands IC2 (through CSIOA-C, SCLK, DMS, & DSM) to select op-amp AEOUT as the output.

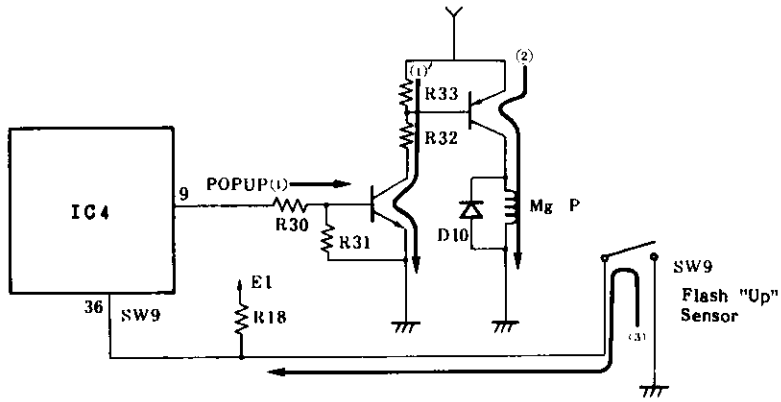
3. The output is sent through AD to IC4's A/D Convertor and the output of the six areas is digitized in turn.

In addition to its routing function Interface IC (IC-2) also amplifies the signal.



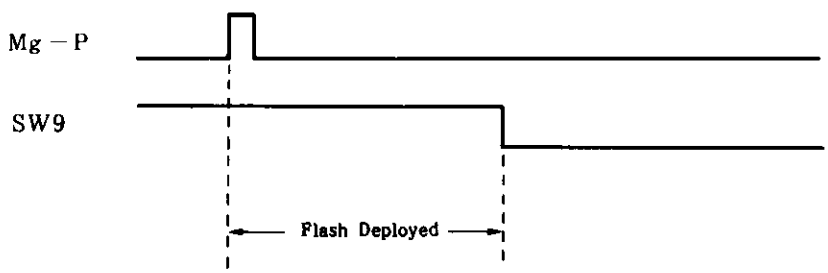
10. Flash Deployment

If the conditions require flash, the flash is automatically deployed (EOS 750).



Principle:

1. IC4 p9 (POPUP) goes "H" turning on Tr6 on and Tr6 in turn turns Tr5 on which energizing the flash magnet MgP.
2. The magnet stays on for about 20ms.
3. Flash deployment is monitored by SW9. Until SW9 turns on, the above sequence repeats.

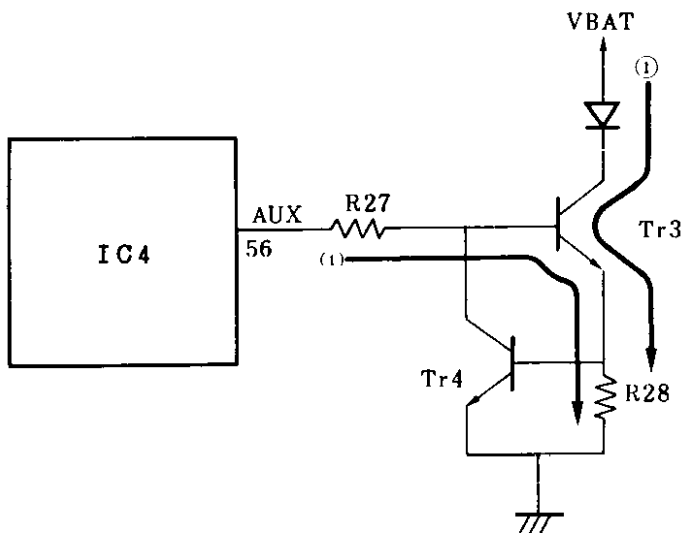


Misoperation:

If conditions for flash exist but the flash does not deploy (due to being manually held down, etc.), when SW2 is pressed, the mirror will go up, the beeper warning sound at 8Hz and the camera will stop.

11. AF Illuminator

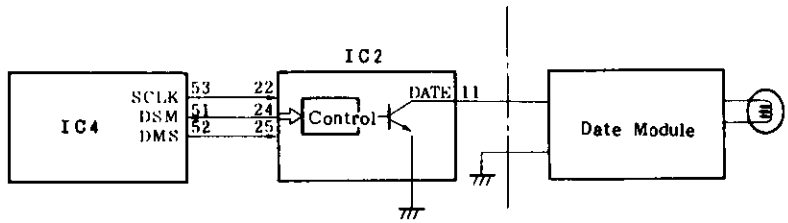
The AF Illuminator will operate when the light level or contrast is low.



Operation: If conditions that require the AF Illuminator exist, IC4's AUX (p56) goes "H" turning on Tr3 and Tr4 activating the AF Illuminator LED (AALED). Tr4 is used to assure stable current flow through the LED. The LED lights for 50 to 300ms depending on subject conditions. The operation repeats up to five times until "In Focus" is achieved.

12. Date Printing

Date printing is controlled by IC2. IC2's DATE pin goes "L" causing the date printing lamp in the date module to light. Exposure is controlled by the time the DATE pin stays "L".



The printing time is determined by the DX code which the camera reads when the film is installed.

13. Flash Circuit (EOS 750 / 750 QD)

The flash circuitry is distributed within the camera as follows:

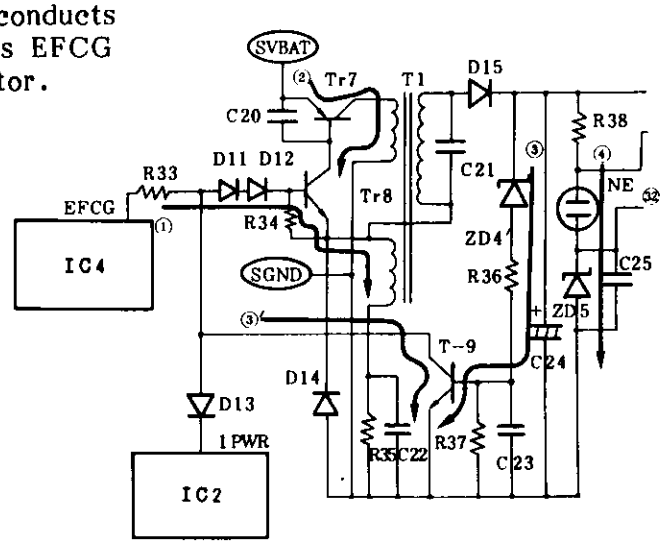
Side CB	Charging and Flash metering
Bottom CB	Charge monitor and Flash
Penta CB	Trigger

NOTICE: All current arrows are for "conventional current" flow from + to -, rather than the more common electron current flow.

Refer to the overall schematic as well as these partial ones.

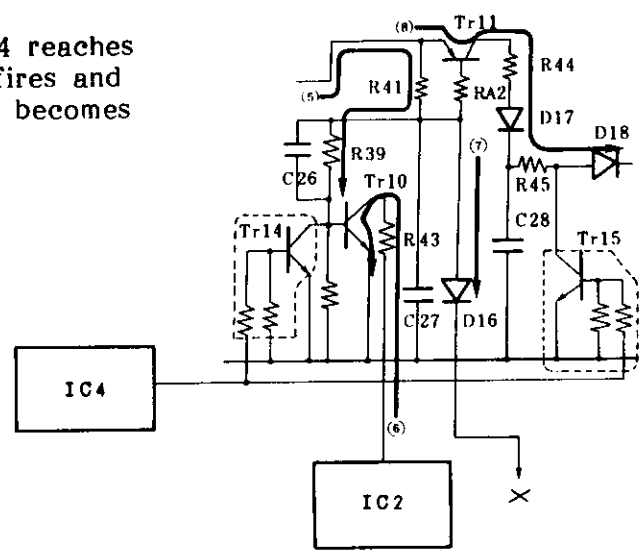
Charging;

1. EFCG of IC4 goes "H" turning Tr8 on, which turns Tr7 on.
2. Tr7, T1 and associated components for an oscillator circuit which charges the main capacitor (C24).
3. When the voltage across C24 reaches 330V, Zener diode (ZD4) conducts turning Tr9 on. This drops EFCG to "L" stopping the oscillator.



Flash Ready Monitor:

4. When the voltage across C24 reaches 250V, the neon lamp (NE) fires and the voltage drop across ZD5 becomes 5.5V.
5. This voltage turns Tr10 on.
6. With Tr10 on, the current through CCC terminal of IC2 is about 270uA, indicating that the flash is ready.



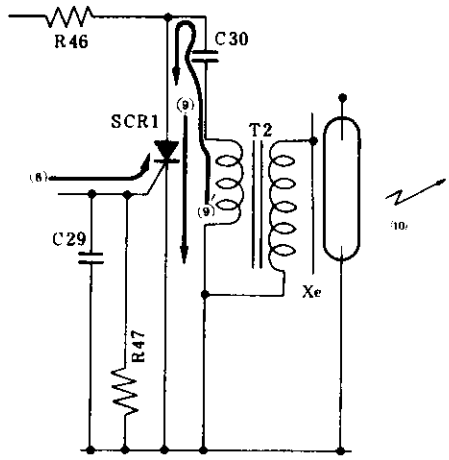
Flash Firing

7. When the X sync contact closes, it places D16 at "L" turning Tr11 on.

8. Through D17 and D18, SCR1 is gated on.

9. With SCR1 on, the current spike through T2 primary as C3 discharges causes a very high voltage pulse in T2 secondary, which ionizes some of the gas in the flash tube (Xe).

10. With this gas ionized the tube resistance drops and the main capacitor discharges through the tube causing a brilliant flash of light.



Flash Inhibit: If the "Flash Off" switch is activated, or if another flash is installed in the hot shoe, IC4's flash inhibit pin (EFINH) goes "H" turning Tr14 on which turns Tr10 off so CCC current is not generated. Additionally, EFINH also turns Tr15 on. Even if The X sync contact closes, turning on Tr11, D18 is held "L" by the switched-on Tr15 so SCR1 is not gated on.

Flash Duration Control:

11. IC2's STSP goes low, turning Tr13 on.

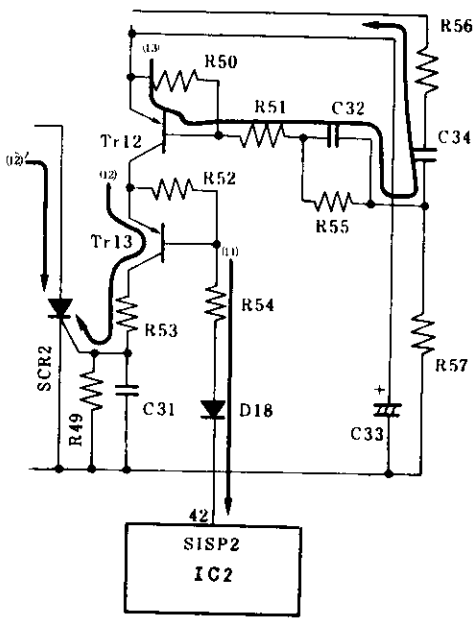
12. This gates SCR2 on which has lower resistance than the flash tube so the remaining charge bypasses the flash tube to ground.

SCR2 Protection Circuit:

This circuit is used to prevent SCR2 from being turned on by spurious noise and being damaged by continuous current flow. With it, SCR2 can only be turned on for a certain time after the flash fires.

13. When the flash fires, Tr12 is turned on.

14. Tr2 stays only as long as C32 and C34 are charging (approx. 800us).



13. Flash Circuit (cont.)

Parameters for Charging

There are two situations calling for charging.

A. If AE metering determines that the lighting requires flash (low or back lighting), the flash deploys and charges until it reaches full charge (330V).

B. After the flash fires and the film wound, the flash charges to minimum charge (250V).

Guide Number

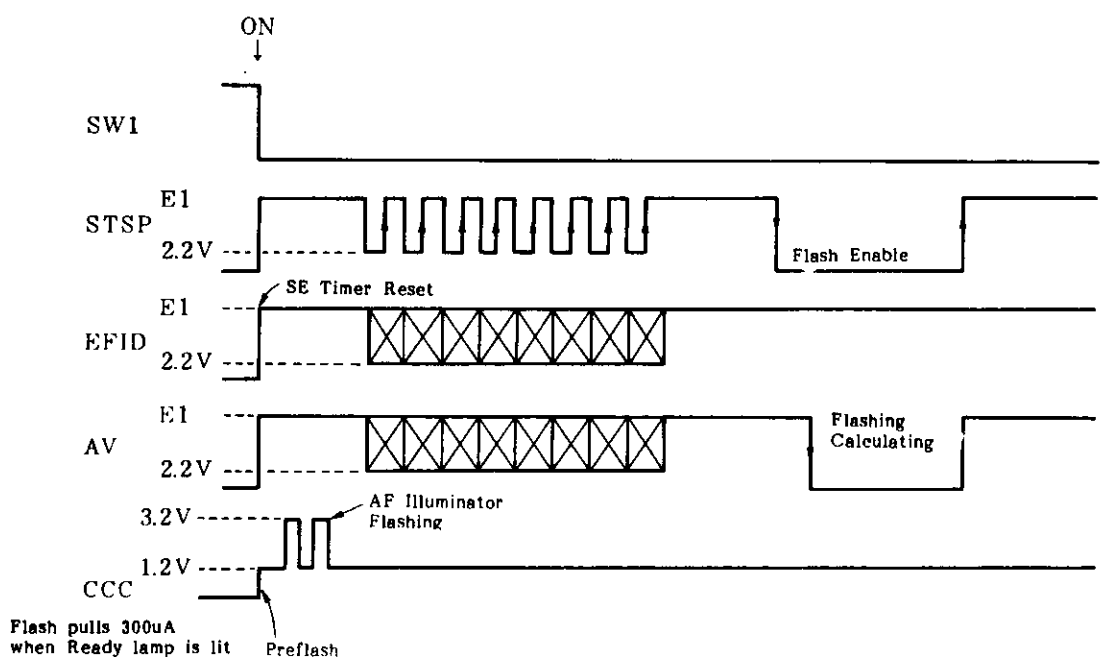
The guide number at full charge (330V) is 11.5 (ISO100, m). At the minimum charge voltage when the neon ready lamp lights, it is 9.

External Flash:

Whether the internal or external flash is used depends on the External Flash Sensor (SW10). If it is on ("L") when SW1 goes on camera - flash communication switches from the built-in flash to the hot shoe unit.

STSP---- Data communications sync clock
EFID ---- Camera ——> Flash
AV ---- Flash ——> Camera

CCC ---- Flash ready, AF Illuminator and preflash signals



Switch	Function	Remarks
SW1	Ranging & Metering Switch	Shutter button ½
SW2	Shutter Release Switch	
SW3	Selector Dial Switches	Selector Dial 4-bit

	SW3-1	SW3-2	SW3-3	SW-Lock	
Self timer	On	On	Off	On	
Program	On	On	On	On	
Lock	On	Off	On	Off	--> On = "L"
Depth	On	Off	Off	On	
Batt. Check	Off	Off	On	On	

SW-Lock	Part of Selector Dial switch	
SW4	Cartridge Sensor	On "H" = Cartridge in
SW5	Back Cover Switch	Closed = On "L"
SW6	Lens Switch	Lens attached = On "L"
SW7	Battery Change Sensor	
SW8 *	Flash Off Switch	Off = "L"
SW9 *	Flash "Up" Sensor	Deployed = On "L"
SW10 *	Ext. Flash Sensor	Flash in shoe = Off "L"
SW-Self	Self-timer Switch	Self-timer beeper switch
CN2	Second Curtain Switch	2nd Curt. closed = On "L"
DX1 DX2 DX3	DX Code Sensors	See code table
FF1 FF2	Film Phase Switch 1 Film Phase Switch 2	Phase shifts with film movement
SF1 SF2	Shutter Phase Switch 1 Shutter Phase Switch 2	Shutter position sensors
SW-X	Flash Sync switch	On = "L"

*: EOS 750 / 750QD only.

ISO DX Code Table

ISO	DX1	DX2	DX3
25	"L"	"L"	"L"
50	"L"	"L"	"H"
100	"L"	"H"	"L"
200	"L"	"H"	"H"
400	"H"	"L"	"L"
800	"H"	"L"	"H"
1600	"H"	"H"	"L"
3200	"H"	"H"	"H"

"L" = Conducting area

"H" = Insulated area

Electrical Parts

750only	Symbol	Part Number	Spec.	Function
	IC1	CH4-0211-000 000	LC4021	· Factor 6 section
	IC2	CH4-0333-000 000	T1913F	· BASIS drive · Lens communication control
				· External flash control · AE,AF LED
				· Flash termination control · Input DX cord
	IC3	WA3-3592-000 000	74HC00	· NAND logic
				· Back Switch input · SW6 input
	IC4	CH4-0332-000 000	68HC11	· Transport control · S W sensor
				· Lens (VBAT) Generation control
				· Shutter drive control · Sequence control
				· Motor control · Interface control
	IC5	CH4-0218-000 000	MPC1710A	· Motor Drive
	IC6	CH4-0213-000 000		· VBAT2 Generation
	BASIS			· AF Sensor
	BZ			· Beeper
	XTAL	WK2-0451-000 000		· Crystal oscillation (8.3MHz)
	DC/DC	CH3-0050-000 000		· VDD,E1,EM generation
	JC	WL5-0311-803 000		· Chip jumper
*	L	WK2-0303-000 000	8uH/70mΩ	· Flash tube protecting coil
	AELED			· AE confirmation LED
	AFLED			· AF confirmation LED
	M	WL1-0082-000 000		· Transport, shutter charge
	Mg3-1			· Shutter 1st curtain magnet
	Mg3-2			· Shutter 2nd curtain magnet
	PD			· Flash termination sensor (Photo diode)
*	AALED			· AF illuminator LED
*	Mg-P			· Flash pop-up magnet
*	Ne		260v	· Flash ready lamp
*	T1			· Flash Charging transformer
*	T2	WE2-9018-000 000		· Flash firing transformer
*	SCR1			· Flash firing start
*	SCR2		CR6 AM-8	· Flash termination SCR
*	Xe		B7C-1653	· Flash tube
	Tr1			· Shutter 1st curtain control
	Tr2			· Shutter 2nd curtain control
*	Tr3			· AF illuminator control
*	Tr4			· AF illuminator control
*	Tr5			· Flash pop-up control
*	Tr6			· Flash pop-up control
*	Tr7		2SA1615	· Flash charging oscillator
*	Tr8		2SC3440B	· Flash charging oscillator control
*	Tr9		2SC2712G	· Flash firing control

750only	Symbol	Part Number	Spec.	Function
*	Tr10			· Flash CCC terminal current
*	Tr11			· Flash firing control
*	Tr12			· SCR2 protection (detect firing)
*	Tr13			· Flash termination stop control
*	Tr14			· Flash firing control
*	Tr15			· Flash firing control
	ZD1			· Motor driver voltage stabilizer
	ZD2			· Motor reverse inhibit
	ZD3			· SW4,SW5 protection
*	ZD4		330V	· Flash charging control
*	ZD5		8.2V	· Flash charging voltage stabilizer
	D1			· Shutter transistor protection
	D2			· SW1 protection
	D3			· Main SW (BC) protection
	D4			· Reverse current prevention
	D5			· Reverse current prevention
	D6			· E1 ON protection
	D7			· E1 ON protection
	D8			· Back cover SW protection
	D9			· Temperature compensation
*	D10			· Pop-up magnet reverse inhibit
*	D11		MA151WA	· Reverse current prevention
*	D12		1SS272	· Reverse current prevention
*	D13		MA151WA	· Reverse current prevention
*	D14		1SS272	· Oscillation stabilizer
*	D15		ES01F	· Reverse current prevention
*	D16			· Protector
*	D17			· Protector
*	D18			· Reverse current prevention
	R1		51K	· Pull up
	R2		51K	· Pull up
	R3		1M	· Motor driver (VPP) noise prevention
	R4		1.2K	· Current control
	R5		1.2K	· Current control
	R6		10K	· Pull up
	R7		51K	· Pull up
	R8		1M	· System clock stabilizer
	R9		51K	· Pull up
	R10		51K	· Pull up
	R11		51K	· Pull up
	R12		51K	· Pull up

750only	Symbol	Spec.	Function
	R13	51K	· Pull up
	R14	5.1K	· Pull up
	R15	51K	· Pull up
	R16	51K	· Pull up
	R17	5.1K	· Pull up
	R18	51K	· Pull up
	R19	51K	· Pull up
	R20	5.1K	· Pull up
	R21	20K	· Beeper volume adjustment
	R22	220K	· Time constant
	R23	220K	· Time constant
	R24	5.1K	· Pull up
	R25	1M	· pull down
	R26	12.1K	· Reference voltage decide
*	R27	1.2K	· Current control
*	R28	5.1K	· Current control
*	R29	100Ω	· Tr5 bias
*	R30	5.1K	· Tr5 bias
*	R31	1.2K	· Tr5 bias
*	R32	100Ω	· Tr5 bias
*	R33	2.2K	· Protector
*	R34	10K	· TR2 bias
*	R35	10K	· Restriction
*	R36	47K	· TR7 bias
*	R37	47K	· TR7 bias
*	R38	1M	· Voltage divider
*	R39	470K	· Tr10 bias
*	R40	1M	· Tr10 bias
*	R41	22Ω	· TR3 bias
*	R42	1K	· Flash X input
*	R43	4.7K	· CCC current
*	R44	10Ω	· Tr11 protection
*	R45	1K	· Tr15 protection
*	R46		· Current restriction
*	R47		· SCR1 protection
*	R48	10K	· Pull up
*	R49	1K	· SCR2 protection
*	R50	10K	· Tr4 bias
*	R51	10K	· Tr12 bias
*	R52	10K	· TR5 bias
*	R53	22Ω	· Current control

750only	Symbol	Spec.	Function
*	R54	4.7K	· Tr5 protection
*	R55	100K	· C32 voltage divider
*	R56	12K	· Voltage dividing resistor
*	R57	100K	· Voltage dividing resistor
	C1		· VPP Generation
	C2		· VPP Generation
	C3	0.01u/25v	· Motor driver (VPP) noise prevention
	C4	4.7u/6,3v	· Noise prevention
	C5	4.7u/6.3v	· Noise prevention
	C6	0.1u/25v	· Noise prevention
	C7	2.2u/8v	· Noise prevention
	C8	4.7u/	· Noise prevention
	C9	4.7u/4v	· Noise prevention
	C10	4.7u/4.0v	· Noise prevention
	C11	220P/25v	· Flash termination integrate capacitor
	C12	220P/25v	· Noise prevention
	C13	10u/16v	· Time constant
	C14	10u/16v	· Time constant
	C15	0.1u/25v	· Noise prevention
	C16	4.7u/4v	· Noise prevention
	C17	0.1u/25v	· Noise prevention
	C18	4.7u/4v	· Noise prevention
	C19	0.01u/6.3v	· Noise prevention
*	C20	1000P	· Noise prevention
*	C21	100P	· Noise prevention
*	C22		· Noise prevention
*	C23		· Tr9 stabilizer
*	C24	4.7u/6.3v	· Main capacitor
*	C25		· ZD1 stabilizer
*	C26		· Tr6 stabilizer
*	C27		· Stabilizer
*	C28		· Stabilizer
*	C29	0.01u	· Stabilizer
*	C30	0.047u	· T2 Oscilation
*	C31		· Stabilizer
*	C32		· Stabilizer
*	C33		· Stabilizer
*	C34		· Stabilizer

IC PIN CONNECTIONS

The following tables list the IC pin connections and a brief description of the function performed.

The meaning of the information in each column is explained here.

Pin No.	Symbol	I/O	A/D	Voltage	Function	"low"	"high"

Pin No. IC Pin Number

Symbol IC pin name

I/O This column indicates whether the pin is an input (I), an output (O), or a clock pulse or power source (V).

A/D This column indicates if the signal is analog (A) or digital (D).

Voltage This indicates the voltage level on the pin.

Example: 0 - E1 indicates a variable voltage between 0 and E1.

VBAT: 6.0V, E1: 5.5V, E2: 5.5V, VDD: 5.5V, VC: 1.2V

Function This column indicates the function of the pin.

"low" This column explains what a digital low on this pin means.

IC 1 (Light metering IC)

Pin No.	Symbol	I/O	A/D	Voltage	Function	"low" "high"
1	S2	I	D	0-E1	6-section sensor	Refer to "Circuit
2	S1	I	D	0-E1	6-section sensor	Explanation"
3	S0	I	D	0-E1	6-section sensor	
4	AGND	V		GND	Digital ground	
5	AEOUT	O	A	1.0-1.6	AE output	
6	VC	V		1.2V	AE output reference voltage	
7	E1	V		E1	Power supply	
8	N.C					
9	N.C					
10	N.C					
11	N.C					
12	N.C					
13	N.C					
14	N.C					

IC 5 (Motor Driver)

Pin No.	Symbol	I/O	A/D	Voltage	Function	"low" "high"
1	C2L	V	D	0-E1	IC6 drive power supply circuit	
2	C1H	V	D	0-10.5	IC6 drive power supply circuit	
3	C1L	V	D	0-E1	IC6 drive power supply circuit	
4	VBAT	V		VBAT	Motor drive power supply	
5	E1	V		E1	Power supply for motor driver	
6	M1F	I	D	0-E1	Motor drive signal input	Refer to "Circuit
7	M1R	I	D	0-E1	Motor drive signal input	Explanation"
8	/PWR	I	D	0-E1	Motor driver reset	reset set
9	DGND	V		0	Digital ground	
10	/VB2 ON	I	D	0-E1	IC6 drive signal input	TMOS OFF ON
11	FSRD	O	D	0-VBAT	Motor drive signal output	
12	PGND	V		0	Motor drive power supply GND	
13	RSFD	O	D	0-E1	Motor drive signal output	
14	TOUT	O	D	0-14v	IC6 drive signal output	TMOS OFF ON
15	VPP	V		14v		
16	C2H	V		0-15v	IC6 drive power supply circuit	

IC 6 (TMOS)

Pin No.	Symbol	I/O	A/D	Voltage	Function	"low" "high"
1	---					
2	---	V		VBAT	Drain	
3	---	V		VBAT	Drain	
4	TOUT	I	D	0-15	Gate	VBAT OFF ON
5	VBAT2	O	D	0-VBAT	Source	VBAT OFF ON
6	---	V		VBAT	Drain	
7	---	V		VBAT	Drain	
8	VBAT	O	D	0-VBAT	Source	VBAT OFF ON

IC 2

Pin No.	Symbol	I/O	A/D	Voltage	Function	"low"	"high"
1	VBATC	V		VBAT	Check VBAT voltage		
2	/PWR	O	D	0-E1	Inhibit motor and flash if VBAT goes under 2.3V	Inhibit	Release
3	N.C	O	A	0-3.2	Analog output to MPU		
4	N.C						
5	VC	V		1.22V	Reference voltage		
6	VRH	V		3.2V	IC4 A/D converter reference voltage		
7	CT	I	A	2.2-3.2V	Flash termination integrating capacitor		
8	ANOD	O	A		Flash termination sensor connection (anode)		
9	CATD	I	A		Flash termination sensor connection (cathode)		
10	/E1 ON	O	D	0-VBAT	Start DC/DC converter	DC/DC ON	OFF
11	DATE	O	D	0-3.0	Date back printing	Printing	
12	/RESET	O	D	0-E1	Reset IC4 if E1 drops	MPU reset	set
13	BAS2	O	D	0-E1	BASIS drive clock		
14	BAS1	O	D	0-E1	BASIS drive clock		
15	/TINTE	O	D	0-E1	Start and end BASIS accumulation		
16	ECLK	I	D	0-E1	IC2 reference clock (2.1MHz)		
17	LEDMOD	I	D	0-E1	LED brightness change input		
18	CSIOC	I	D	0-E1			
19	CSIOB	I	D	0-E1	IC2 internal control input		
20	CSIOA	I	D	0-E1			
21	E1	V		E1	Power supply		
22	SCLK	I	D	0-E1	IC4 communication clock (64kHz)		
23	DGND	V		0	Digital ground		
24	DMS	I	D	0-E1	IC4 communication input		
25	DSM	O	D	0-E1	IC4 communication output		
26	LCLK	I	D	0-VDD	Lens clock		
27	DLC	I	D	0-VDD	Lens communication input		
28	DCL	I	D	0-VDD	Lens communication output		
29	SW6	I	D	0-VDD	Detect lens		Installed
30	F10	O	D	0-E1	BASIS drive signal		
31	F1	O	D	0-E1	BASIS drive signal		
32	F8	O	D	0-E1	BASIS drive signal		
33	F7	O	D	0-E1	BASIS drive signal		
34	F9	O	D	0-E1	BASIS drive signal		
35	F3	O	D	0-E1	BASIS drive signal		
36	F2	O	D	0-E1	BASIS drive signal		
37	F6	O	D	0-E1	BASIS drive signal		
38	F4	O	D	0-E1	BASIS drive signal		
39	F5	O	D	0-E1	BASIS drive signal		
40	AELED	O	D	0-VBAT	AELED lighting	ON	
41	AFLED	O	D	0-VBAT	AFLED lighting	ON	
42	STSP2	O	D	0-E1	Stop flash firing	Stop at leading edge	firing
43	STSP	O	D	0-E1	Flash communication clock		
44	EFID	O	D	0-E1	Flash communication terminal output	Refer to "Circuit Explanation"	
45	AV	O	D	0-VDD	Flash communication terminal input		
46	CCC	O	D	0-3.2	Detect flash charging ready Pre-flash, illumination		
47	TEMP	O	D	0-0.5	Diode connection (anode)		
48	IREF	I	A	VC	VC generation reference terminal		
49	VREF	V		1.9	BASIS reference voltage		
50	VIDMIN	I		2.5	BASIS image input (dark level)		
51	VIDMAX	I		0.7	BASIS image input (peak level)		
52	VIDEO	I		0-0.3	BASIS Video signal input		
53	---	V		0	Analog ground		
54	QVC	V		0.3			
55	E2	V		E2	IC2 internal analog power supply		
56	AD	O	A	0.2-3.2	Analog signal output		
57	AEOUT	I	A	1.0-3.4	Light metering sensor signal input		
58	DX1	I	D	0-VDD	DX code input		
59	DX2	I	D	0-VDD	DX code input	Refer to "SW	
60	DX3	I	D	0-VDD	DX code input	Nomenclature"	

IC4

Pin No.	Symbol	I/O	A/D	Voltage	Function	"low"	"high"
1	SW2	I	D	0-E1	Input SW2	SW2 ON	SW2 OFF
2	N.C						
3	N.C						
4	N.C						
5	M1R	O	D	0-E1	Motor control	Refer to "Circuit	
6	M1F	O	D	0-E1	Motor control	Explanation"	
7	EFCG	O	D	0-E1	Flash charging start signal	Inhibit	Start
8	EFINH	O	D	0-E1	Inhibit firing		Inhibit
9	PUPUP	O	D	0-E1	Flash pop-up		Pop-up
10	CSIOC	O	D	0-E1	IC2 internal control output		
11	CSIOB	O	D	0-E1	IC2 internal control output		
12	CSIOA	O	D	0-E1	IC2 internal control output		
13	AD	I	D	0-3.2	Output analog signal from IC2		
14	SF2	I	A	0-E1	Detect shutter charge	Refer to "Circuit	
15	SW3-1	I	D	0-E1	Detect main SW	Explanation"	
16	SF1	I	D	0-E1	Detect shutter charge		
17	SW3-2	I	D	0-E1	Detect main SW		
18	FF2	I	D	0-E1	Detect film transport		
19	SW3-3	I	D	0-E1	Detect main SW		
20	FF1	I	A	0-E1	Detect film transport		
21	AGND	V		0	A/D converter reference voltage (GND)		
22	VRH	V		3.2	A/D converter reference voltage		
23	DGND	V		0	Digital ground		
24	DGND	V		0	Digital ground		
25	MODB	I	D	0-E1	Tool communications port		
26	N.C						
27	MODA	I	D	0	Changeover FPU mode	Always "low"	
28	N.C						
29	ECLK	O	D	0-E1	IO clock	MPU internal clear	Access to IO
30	N.C						
31	XTAL	V			8.3MHz terminal		
32	N.C						
33	XTAL	V			8.3MHz terminal		
34	SW10	I/O	D	0-E1	Detect external flash		Installed (not pop-up)
35	N.C						
36	SW9	I/O	D	0-E1	Detect flash fully poployed		Fully poployed
37	/TINTE	O	D	0-E1	Start and end BASIS accumulation	Start at leading ed.	End at trailing ed.
38	SW4	I	D	0-E1	Detect film cartridge		Installed
39	SW5	I	D	0-E1	Detect back cover	opened	closed
40	S0/CAGC	O	D	0-E1	Control BASIS and AE sensor		
41	S1/BAS1	O	D	0-E1	Control BASIS and AE sensor		
42	S2/BAS2	O	D	0-E1	Control BASIS and AE sensor		
43	/RESET	I	D	0-E1	Reset IC4	Reset	Set
44	N.C						
45	XIRQ	V		E1			
46	IRQ	V		E1			
47	RXD	I	D	0-E1	Tool communications port (input)		
48	N.C						
49	DGND	V		0	Digital ground		
50	TXD	O	D	0-E1	Tool communications port (output)		
51	DSM	I	D	0-E1	IC2 (IO) communication input		
52	DMS	O	D	0-E1	IC2 (IO) communications output		
53	SCLK	I/O	D	0-E1	IC2 (IO) communications clock		
54	/VB2 ON	O	D	0-E1	VBAT2 control	OFF	ON
55	E1	V		E1	IC4 power supply		
56	AUX	O	D	0-E1	AF illuminator control		Flashes
57	BEEP	O	D	0-E1	Beeper control	OFF	ON
58	LEDMOD	O	D	0-E1	LED brightness change		
59	Mg3-2	O	D	0-E1	Shutter 2nd curtain current	OFF	ON
60	N.C						
61	N.C						
62	Mg3-1	O	D	0-E1	Shutter 1st curtain current	OFF	ON
63	CN2	I	D	0-E1	Shutter 2nd curtain run signal	completed	incompleted
64	SW1	I	D	0-E1	Input SW1	ON	OFF

REPAIR INSTRUCTIONS

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PREPARATIONS for REPAIR:

EOS 750 HIGH VOLTAGE!!

The main capacitor of the built-in flash unit is almost always at least partially charged. After removing the battery and the bottom cover, drain any remaining charge with a low resistance, high wattage resistor across the points marked in figure 1.

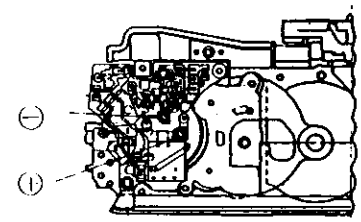


Fig. 1 750 / 750QD
Bottom Board

EOS TOOL Communications Port

The communications port (connection) for the EOS TOOL is located on the bottom of the camera, rather than on the front as it is in the EOS 650/620. When connecting the tool, the Tuffy sealant should be wiped with Keton or other suitable cleaner. After repairs are complete, reseal the connection with Tuffy, or Humiseal if Tuffy is not available.

IC4 and Main Flex Replacement

When IC4 is changed, the camera will not operate until the EOS Tool is used to "initialize" the chip. When the main flex is changed, IC4 is initalized to a standard value, but it is not adjusted. All IC4 adjustments must be performed whenever either the main flex or IC4 is replaced.

Viewfinder Cleaning

The focusing screen is not user interchangeable as it is in the EOS 650/620, but it can be removed easily through the lens mount, by removing its holder in order to clean the viewfinder .

Color Code

To save space on drawings, it is necessary to uses a color code.

Color	Code	Color	Code	Color	Code
Black	BL	Blue	BU	Gold	GL
Brown	BR	Violet	V	Tan	T
Red	R	Purple	PR	Pink	PK
Orange	O	Gray	GY	Sky Blue	SB
Yellow	Y	White	W	Yellowish Green	YG
Green	GN	Silver	S		

TOOLS and EXPENDABLES LIST

TEST EQUIPMENT (*: New equipment)		Part No.
Multi-camera Tester EF 500AC		CY9-7020-000 XXX
TTL-OTF Photoreceptor DIR-201		CY9-7067-000 XXX
Extended Range Shutter Tester FS-5300		CY9-7066-000 XXX
Regulated Voltage Power Supply (532C)		CY9-7038-000 XXX
Universal Type 90° Collimator or		NS
Simplified 90° Collimator		CY9-1055-000
Universal 600mm Range-viewfinder Collimator		CY9-7075-000
1.3mm Hex Key (Mirror Angle)		CY9-7059-000
Focusing Rail		CY9-1071-000
AF Standard Tool Lens		CY9-1072-000
Mount Adaptor		CY9-1073-000
44.14mm Block Gauge		CY9-1001-007
2mm Adaptor Ring (Dial gage)		CY9-1001-008
Main Mirror Adjustment Mirror		CY9-1074-000
Sub-mirror Adjustment Mirror		CY9-1076-000
AF Standard Reflectance Charts	2% (Black)	CY9-1066-000
	64% (Light Gray)	CY9-1067-000
	90% (White)	CY9-3053-000
Tool Dummy Battery Parts	Top Cover	CY4-0071-000
	Bottom Cover	CY4-0072-000
	Contacts (x2)	CY4-0070-000
Bleeder Resistor (0.82 Ohm, 2W, 10%)		CY4-0073-000
EOS Tool (all electrical adjustments)		CY9-1081-000
* Memory Card EOS 750 / 850 (J)		CY9-1080-005
* Memory Card EOS 750 / 850 (E)		CY9-1080-006
* EOS Communications Adaptor (750)		CY9-1083-000
* Tool Focusing Screen (Local Fabrication from EOS Type B screen)		
* Tool Mirror (Local Fabrication from:		CY9-1074-000)

Expendables

Diabond (G103)	CY9-8002-000
Cemidyne Hi-Super	CY9-8005-000
Screw-lock (Blue)	CY9-8012-000
Aron Alpha	CY9-8007-000
Astro Oil	CY9-8017-000
Silicone Bond (KE347B)	CY9-8064-000
IF-10	CY9-8088-000
Electro-oil 190	CY9-8089-000
Electro-lub 2GX	CY9-8039-000
ED-16 Grease	CY9-8075-000
PL-015	CY9-8073-000
Humiseal 1B-66	CY9-8069-000
H26	CY9-8079-000
NF-33 oil retardant	CY9-8090-000

TOOL FOCUSING SCREEN and MIRROR

A split-image (Type B) focusing screen is necessary for finder focus adjustment, and a mirror to replace the focusing screen is necessary for mirror angle adjustments. The 750 and 850 do not have interchangeable screens, so a EOS 650 type B screen is modified for the focus adjustment and a tool mirror (CY9-1074-000) modified in the same way for the mirror angle adjustment.

Tool Focusing Screen

1. Procure an EOS Type B focusing screen unit. Remove the screen from the frame and file it down to the dimensions shown below.

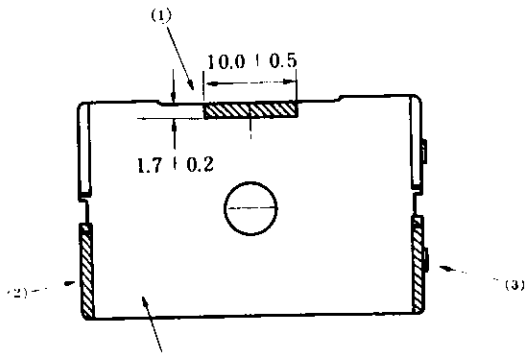


Fig. 2-1:

At (2) and (3), dimensions are not critical. Removal of the protrusions is the objective.

2. Install with the cut toward the rear and the fresnel lens up, as shown in figure 2-2.

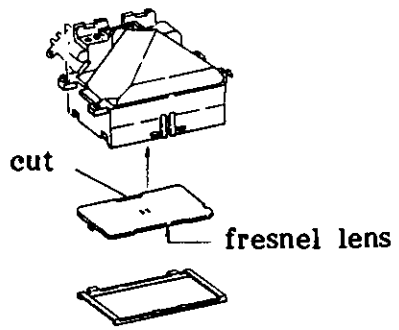


Fig. 2-2:

Tool Mirror

1. Procure a tool mirror and trim as shown.

2. Install in a spare focusing frame and use for mirror angle adjustments.

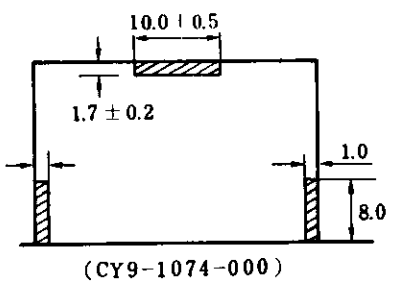
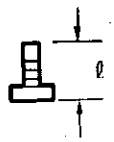


Fig. 3.

ASSEMBLY and DISASSEMBLY

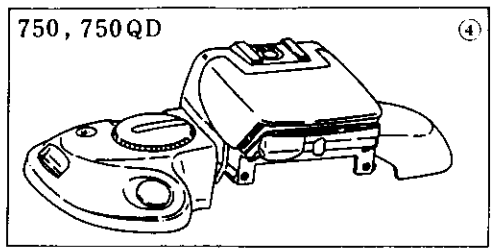
External Parts Removal
(Base: EOS 850)

As an added convenience, the length and pitch of external screws is included on the drawing. All screws are black unless otherwise noted.



Minor Accessory
C50-9061

④
Countersunk Screw
X2



Selector Dial Contacts

Bright Screw x 2

It is not normally necessary to remove these parts. Loosen screws only.

Around hole

Latch hook

X2

(ℓ 4.5 P 0.5)

Apply ED-16 as indicated:
(Don't put lube on contacts!)

(ℓ 4.5 P 0.35)

Access after back cover opened

Friction surfaces

Around hole (ℓ 3.5 P 0.35)

(ℓ = 4.0 P = 0.5) X2

(ℓ = 6.5 P = 0.35)

③

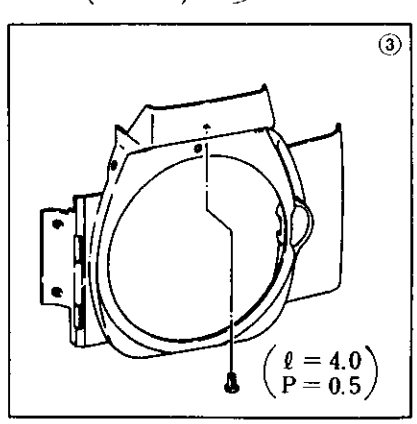
X2

(ℓ = 4.0 P = 0.5)

(ℓ = 4.0 P = 0.5)

①

Electrical adjustments are possible after the bottom cover is removed.



750, 750QD

(ℓ = 4.5 P = 0.5) X4 (ℓ = 6.0 P = 0.5)

②

DISASSEMBLY NOTES

REMOVAL Flow Chart — Remarks

(1) Grip

(2) End Cover — 4 Screws

(3) Apron — Loosen hook cover Screws: 850 - 6, 750 - 7

(4) Top Cover — 6 Screws

Top Cover Removal

<<< 850 >>>
Unsolder 5 screws from main flex and 2 from top cover.

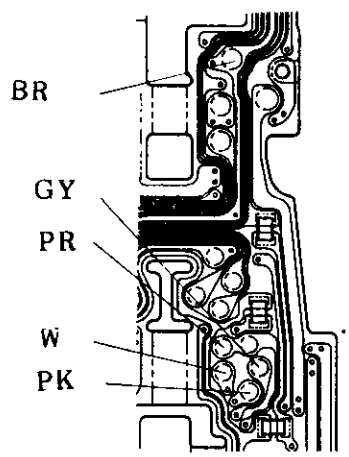


Fig. 4: Main Flex

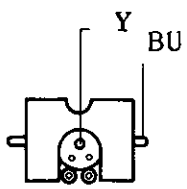


Fig. 5: Top Cover

<<< 750 / 750QD >>>

If the top cover is to be disassembled, unsolder 11 leads from the main flex and 6 from the Penta Board.

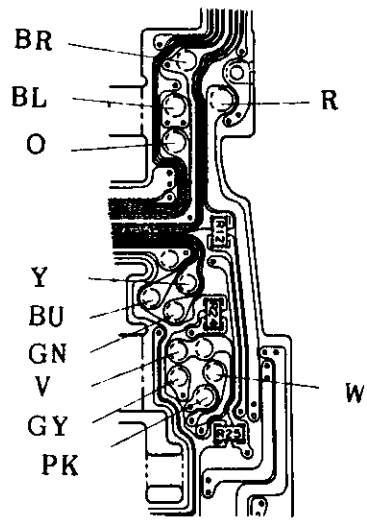


Fig. 6: Main Flex

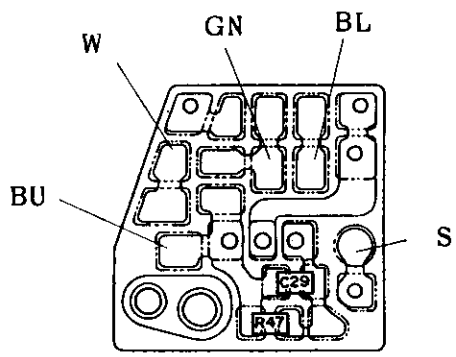


Fig. 7: Penta Board

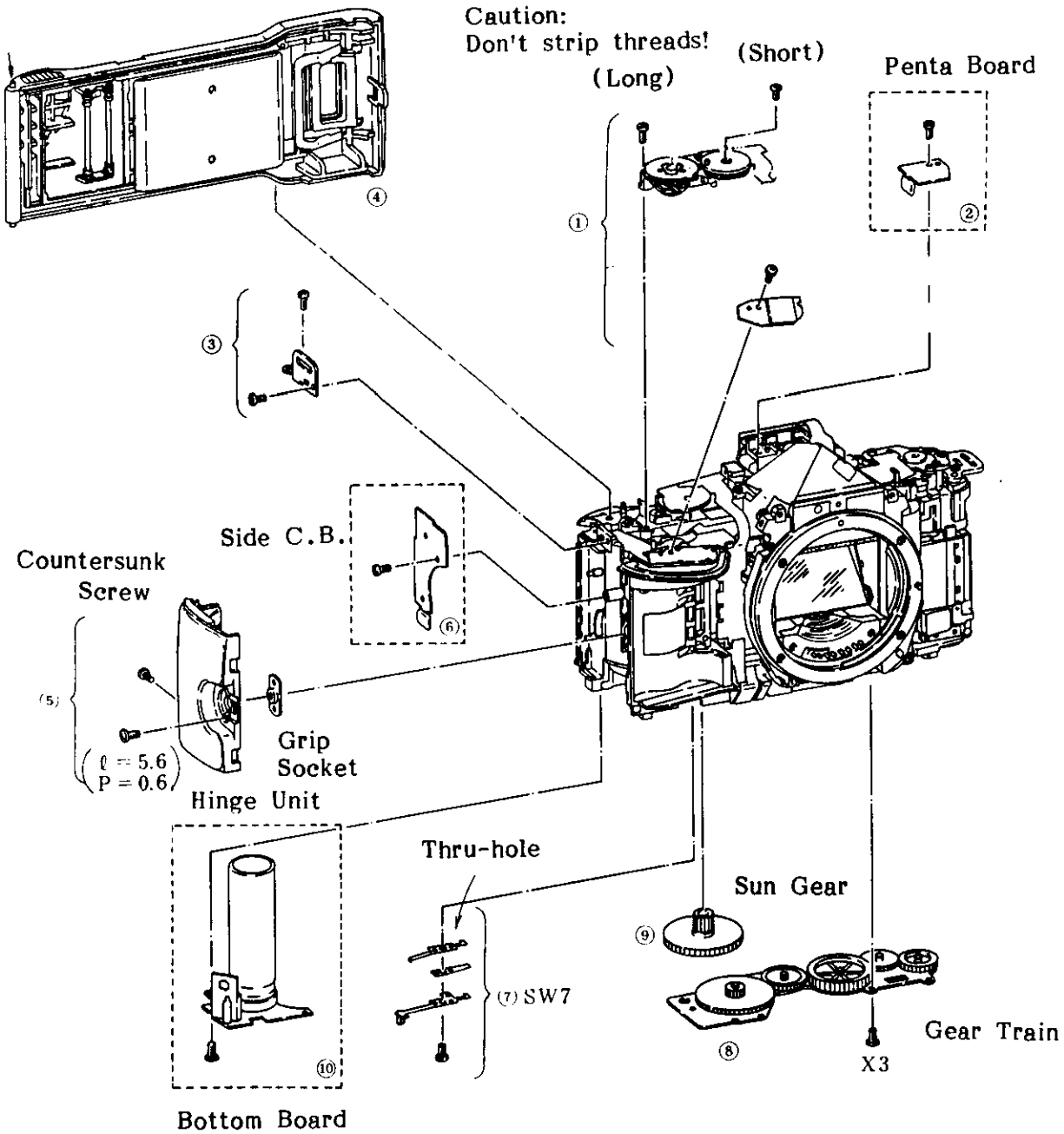
ASSEMBLY NOTES

Top Cover

When installing the top cover, set the selector dial to self timer and turn the selector dial contacts completely CCW against the stop.

FLASH CIRCUIT BOARDS
<<< 750 / 750QD >>>

This procedure is the fastest method for removing the three flash circuit boards (Upper Board, Side Board, and Bottom Board on the Wiring Diagram.



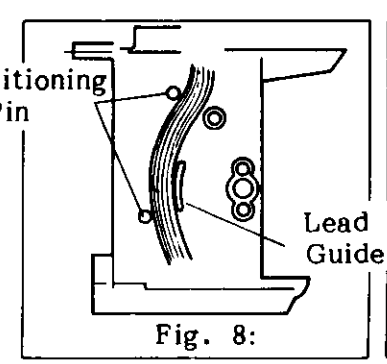


Fig. 8:

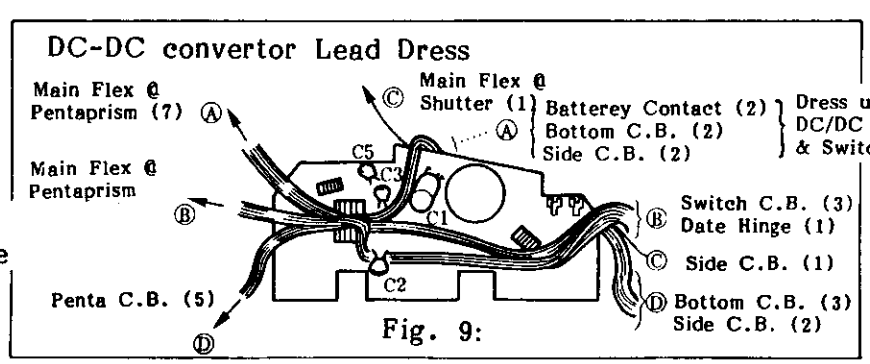


Fig. 9:

DISASSEMBLY NOTES

REMOVAL Flow Chart Index No.		Remarks
(1)	Film Counter Assy	2 Screws
	12 (14 = QD) lead wires	
(2)	Penta Board	1 Screw
(3&4)	Right Strap Lug	2 Screws
(5)	Hinge Unit & Grip Socket	3 Screws
(6)	Side Board	1 Screw
(7)	SW 7	1 Screw Thru-hole
(8)	Gear Train	3 Screws
(9)	Sun Gear	
(10)	Bottom Board	1 Screw

ASSEMBLY NOTES

Lead Dress

Dress leads from the bottom board so they run flat and neat between the side board positioning pin and the lead wire guide (Fig. 8). If not correctly dressed, they will interfere with components on the back of the board.

Dress the DC-DC convertor leads as shown in figure 9 to prevent interference with the selector dial and counter.

Lead Wire Removal

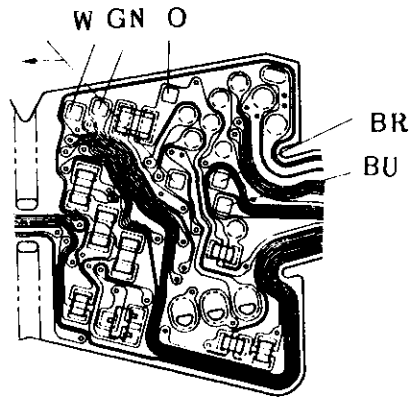


Fig. 10: Main Flex @ Prism

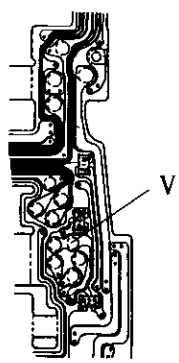


Fig. 11: Main Flex @ Shutter

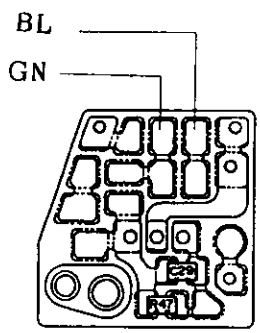


Fig. 12: Penta Board

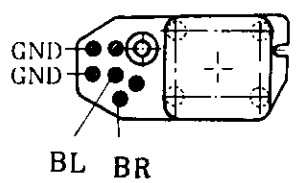


Fig. 13: Shutter Switch

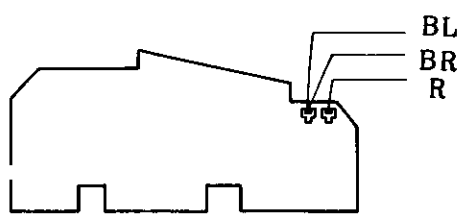
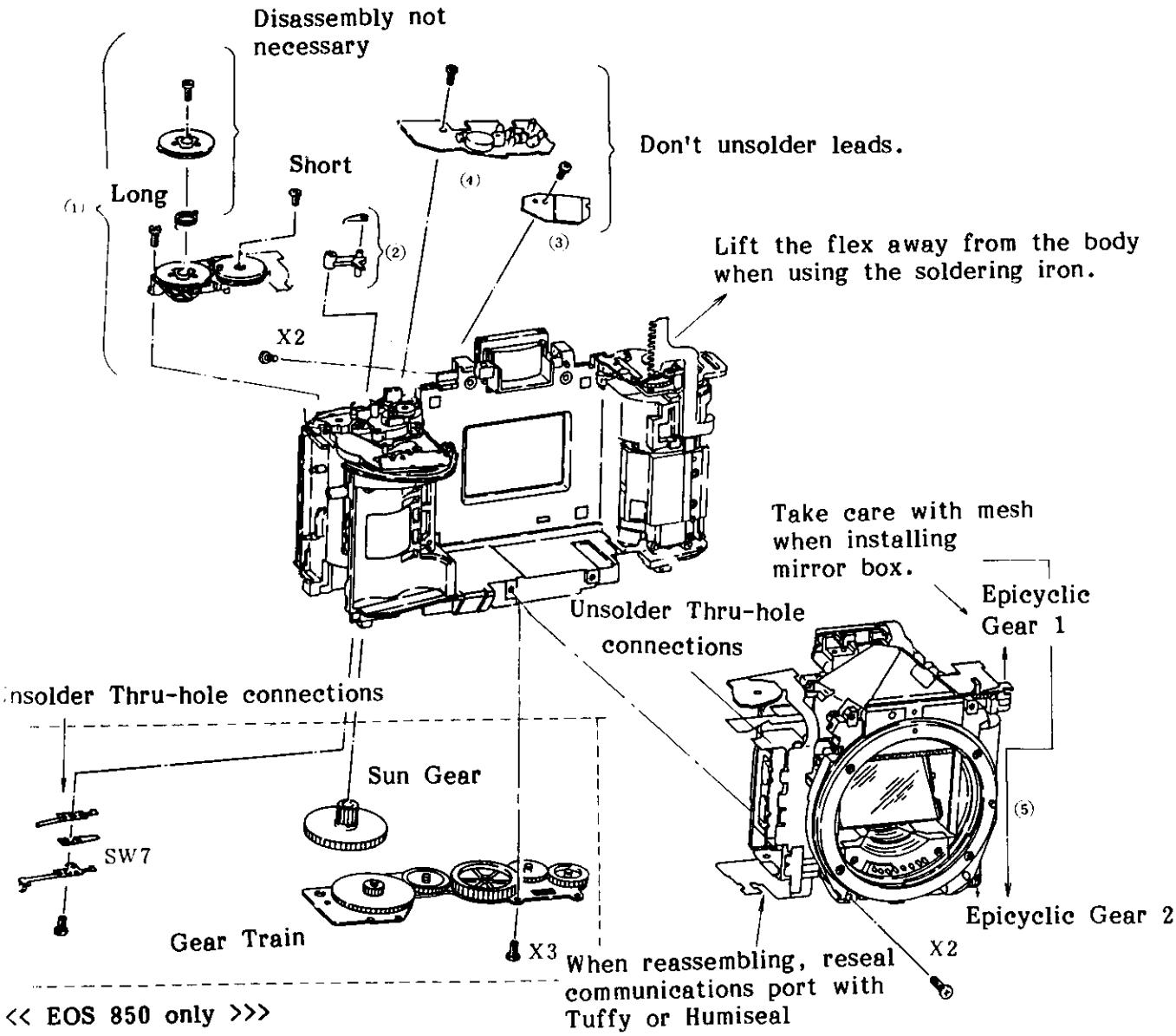


Fig. 14: DC-DC Convertor Battery Contacts

MIRROR BOX

This procedure is the quickest way to remove the mirror box without removing unnecessary parts.



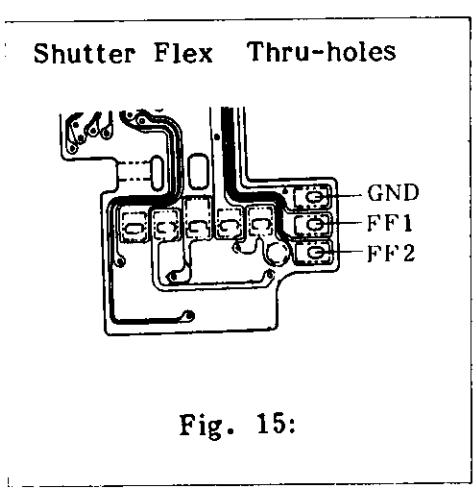


Fig. 15:

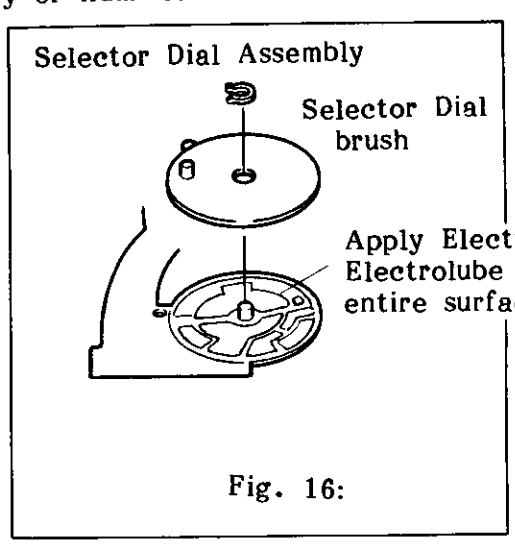


Fig. 16:

MIRROR BOX

DISASSEMBLY NOTES

(Short-cut Procedure)

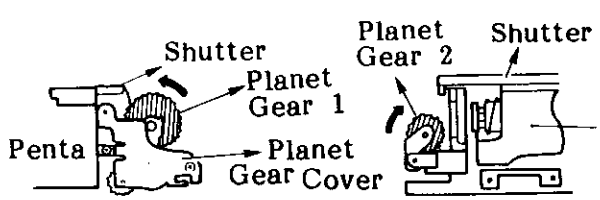
This procedure is based on the EOS 750 after the flash circuit boards (previous page) have been removed. For the EOS 850 it is necessary to remove the counter assy., SW7, and the gear train.

REMOVAL Flow Chart Index No.		Remarks
(1)	Counter Drive Lever	
(2)	Switch Board	1 Screw
(3)	DC/DC Convertor	1 Screw Unsolder Batt. leads
	DX Flex Connection	Lift flex away from body for unsoldering
	Signal Board	3 thru-hole connections with main flex
(4)	Mirror Box	4 Screws

ASSEMBLY NOTES

Installation

Use Planet Gears 1 and 2 in the directions show when installing the mirror box.



The selector dial contacts normally need not be disassembled. If they are, the contact board should be cleaned and lubricated with Electroil 190 and Electrolub 2GX.

Counter Spring Installation

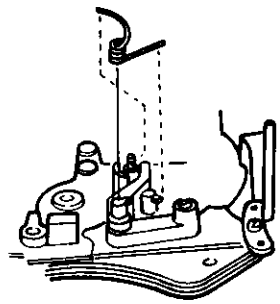


Fig. 18:

Independent Operation of Mirror Box

By making the following connections, the mirror box can be made to operate independently of the body. (It operates as if the back cover was closed and film was not loaded).

1. Remove the mirror box with the DC-DC convertor and the and SW1-2 circuit board connected to it.

   If the VBAT + and - leads from the DC-DC convertor to the main flex have been disconnected, reconnect them.

2. Short the SW5 and GND pads as shown (if not shorted, the mirror box operates in the prewind mode.

3. Connect a 6VDC input to the DC-DC convertor or to the communications port 6V terminals as shown.

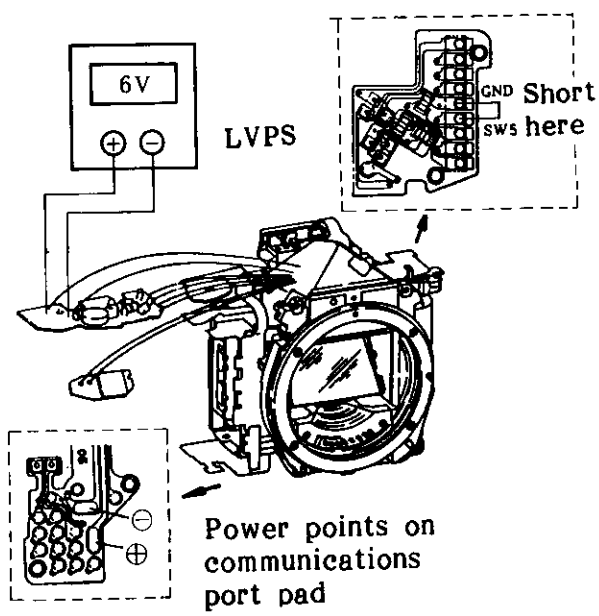
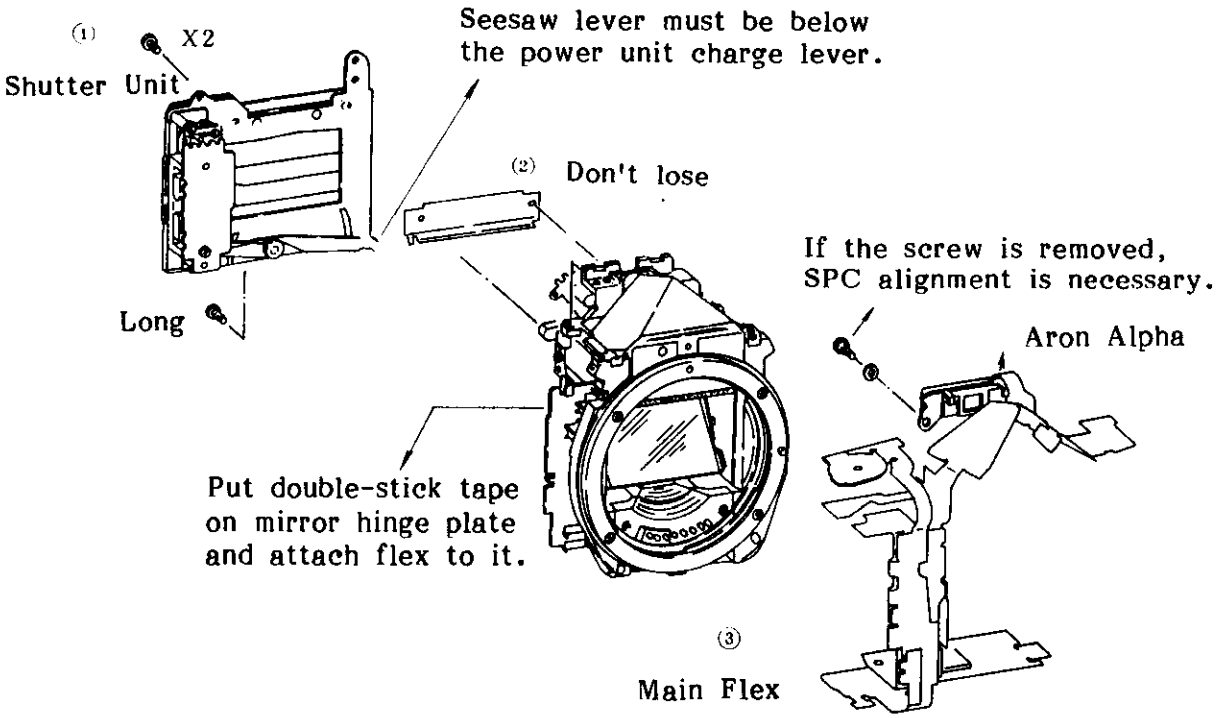


Fig. 19: Communications Port

SHUTTER UNIT and MAIN FLEX


(1) X2
Shutter Unit
Seesaw lever must be below the power unit charge lever.
(2) Don't lose
If the screw is removed, SPC alignment is necessary.
Aron Alpha
Long
Put double-stick tape on mirror hinge plate and attach flex to it.
(3)
Main Flex

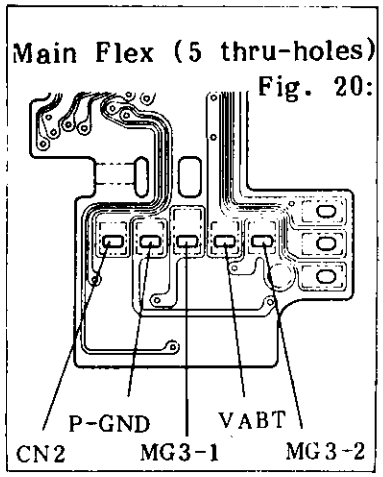


Fig. 20:

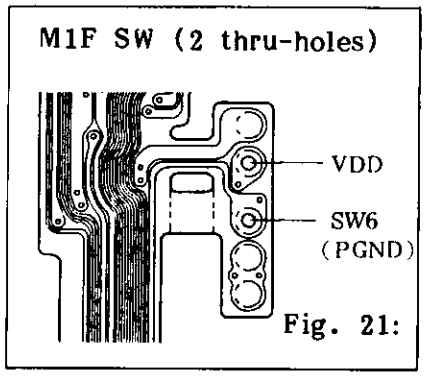
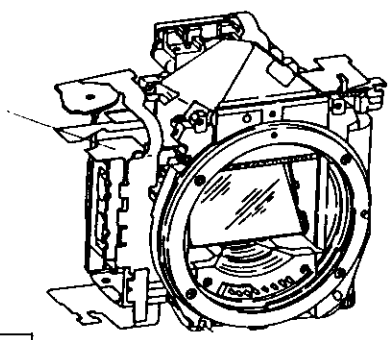
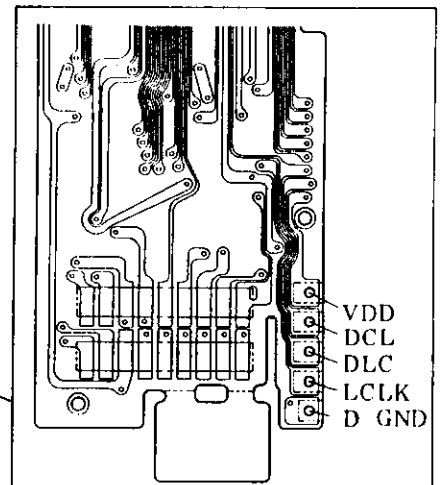


Fig. 21:





BA Flex Connection and Mount Connector (5 thru-holes)

Fig. 22:

DISASSEMBLY NOTES

REMOVAL Flow Chart Index No.

		Remarks
(1)	Shutter Unit	3 Screws 5 thru-holes
(2)	Light Shield	
	BA Flex Connector	
	Mount Connector	5 thru-holes
	Lead Wires(5)	5 lead wires
<!!>	SPC Holder	2 Screws Aron Alpha
(3)	Main Flex	

<!!>: SPC Alignment is necessary if removed.

Lead Wire Removal

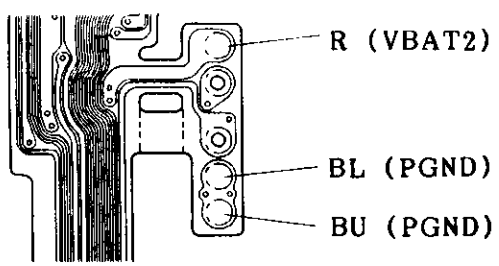


Fig. 23: Main Flex @ M1F SW

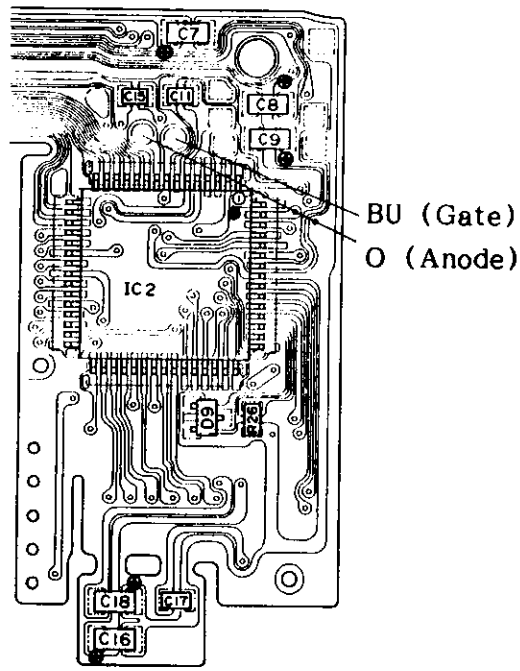


Fig. 24: Main Flex TTL Sensor Leads

ASSEMBLY NOTES

Shutter Unit

Shutter must be charged when installed, for access to screw hole.

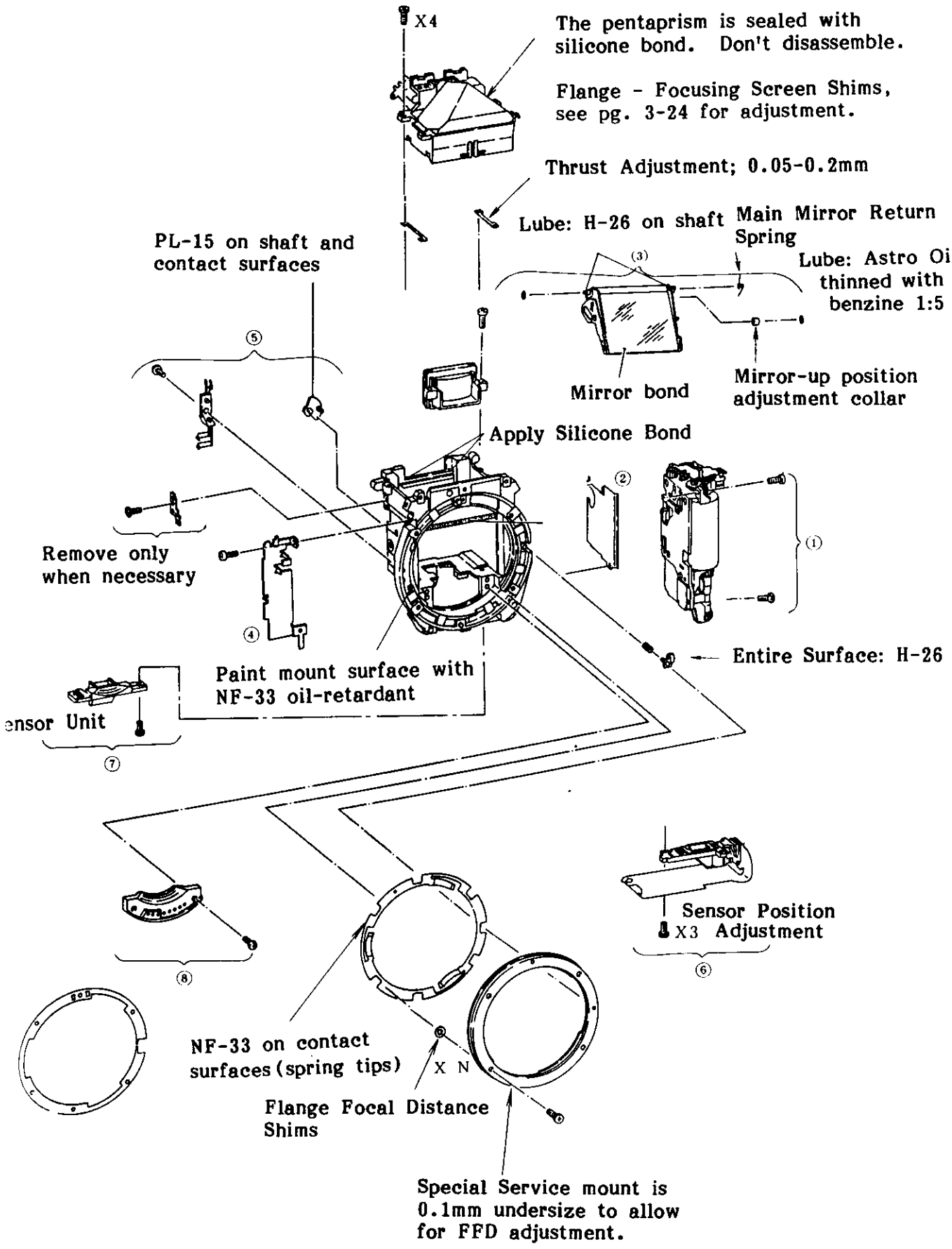
The seesaw lever must be below the Power unit's charge lever.

DO NOT touch the shutter blades.

SPC Holder

After adjusting the SPC alignment, fix it in position with Aron Alpha.

MIRROR BOX DISASSEMBLY


X4
The pentaprism is sealed with silicone bond. Don't disassemble.
Flange - Focusing Screen Shims, see pg. 3-24 for adjustment.
Thrust Adjustment; 0.05-0.2mm
Lube: H-26 on shaft
Main Mirror Return Spring
PL-15 on shaft and contact surfaces
Lube: Astro Oil thinned with benzine 1:5
Mirror bond
Mirror-up position adjustment collar
Apply Silicone Bond
Remove only when necessary
Entire Surface: H-26
Paint mount surface with NF-33 oil-retardant
ensor Unit
Sensor Position
X3 Adjustment
NF-33 on contact surfaces (spring tips)
X N
Flange Focal Distance Shims
Special Service mount is 0.1mm undersize to allow for FFD adjustment.

DISASSEMBLY NOTES

If the following parts are removed, adjustment is necessary. Remove them only when specifically necessary.

Part	Adjustment	Page
Power Unit	Both mirror angles, check only ----------	3-20
Mirror Hinge Plate	Both mirror angles	3-20
Basis (BA) Flex	Sensor Position --	3-22
Mirror Unit (if replaced)	Both mirror angles	3-20
	Mirror-up Position	3-13
	Mirror Shaft Thrust	3-13
Mount (if replaced)	Flange - Focal Distance ---	3-23
Pentaprism Unit (if replaced)	Flange - Focal Distance	

ASSEMBLY NOTES

Main Mirror Spring Installation

Temporarily hook the mirror return spring here.

Mirror Return Spring hook

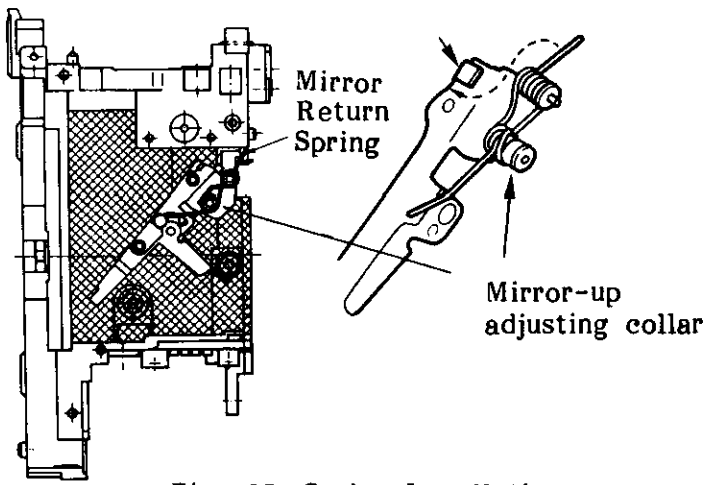


Fig. 25: Spring Installation

Mirror Return Spring Torque

Place the mirror unit upside-down and pull the mirror down to the "mirror-up" position and let go. It should return to the down position. [Spring torque (measured as tension at mirror edge): 3-10g] If not, change the return spring.

Mirror-up Adjustment

Turn the motor in the "A" direction to raise the mirror. Select a collar which leaves no space between the mirror and the cushion.

Mirror Thrust Play

Use washers to adjust the thrust play to 0.05 to 0.2mm by changing the washers.

Additional Information

The mirror unit should be replaced whenever either of the mirrors must be replaced. The mirror base is usually deformed when a cracked mirror is removed. These procedures are included mainly for reference.

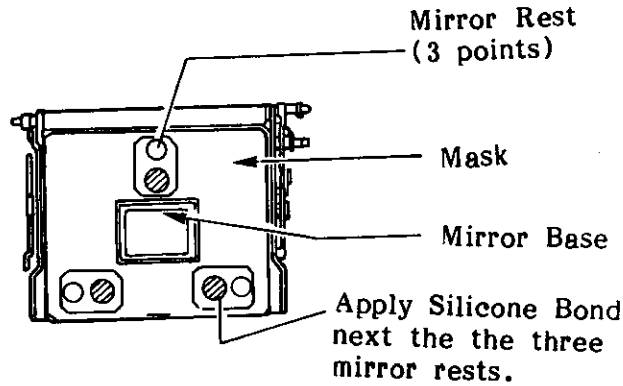
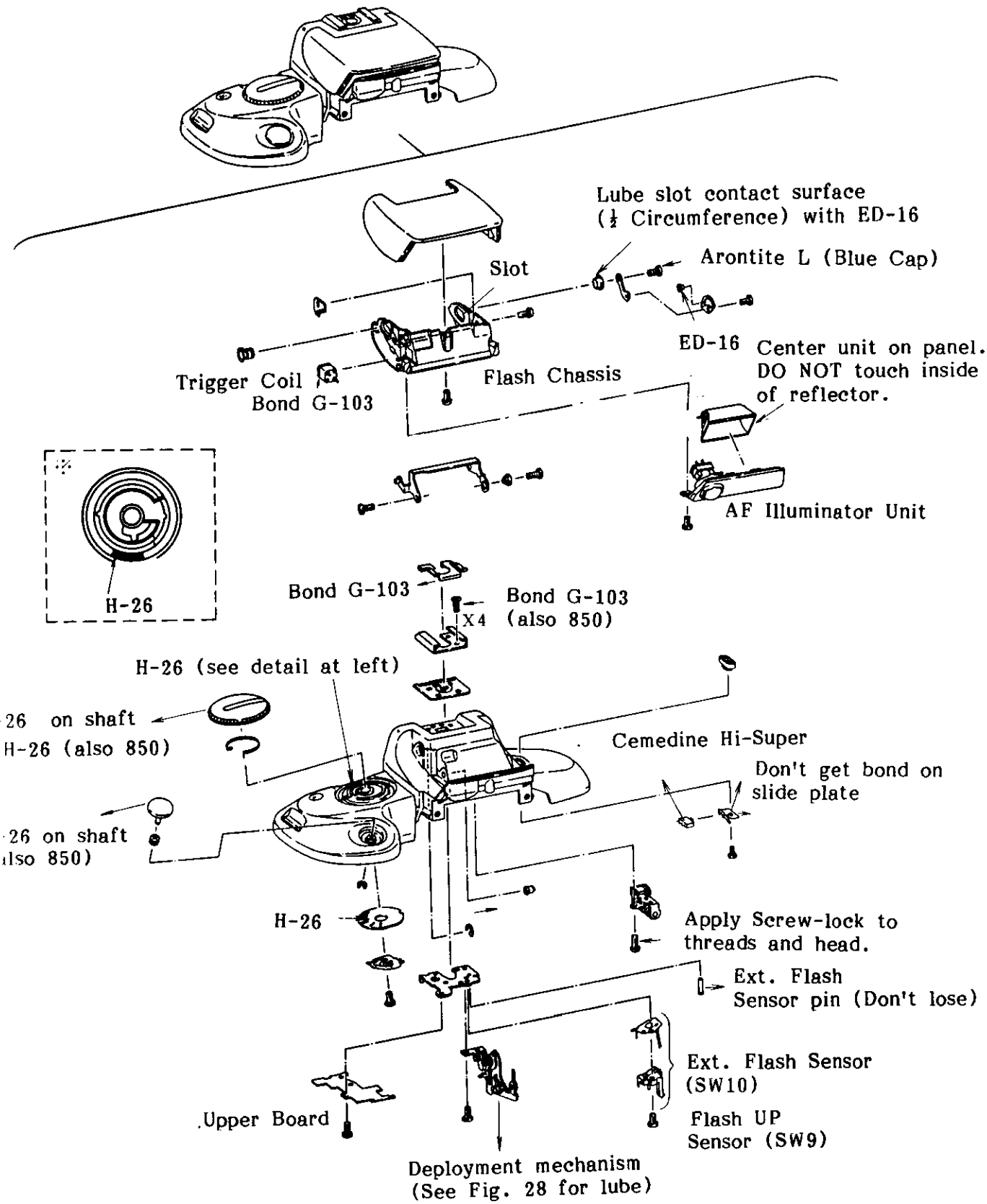


Fig. 26

EOS 750 TOP COVER DISASSEMBLY

Except when electrical components or shoe contacts must be replaced, it is not normally necessary to disassemble the top cover.

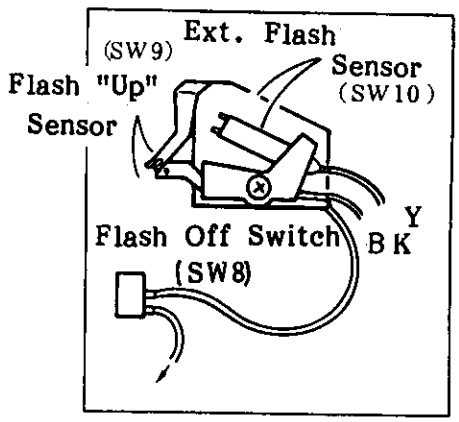


EOS 750 TOP COVER DISASSEMBLY

ASSEMBLY NOTES

Flash Up Sensor Operation

Push the deployment magnet Mg-P with tweezers so the flash deploys. When deployed, the Flash Up sensor (SW9) should be on. If not work the flash deployment mechanism several times.



Flash Reflector Unit Installation

Center the reflector on the panel, which is longer than the reflector.

External Flash Sensor Operation

The external flash sensor (SW10) should be off when a flash is installed in the hot shoe.

Flash Deployment Mechanism Springs

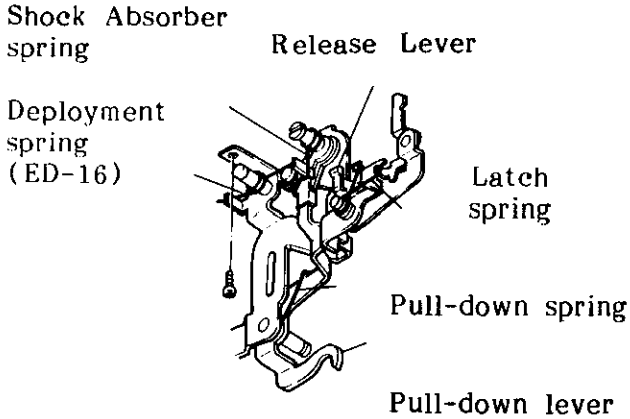


Fig. 28:

Lead Dress

Run the trigger lead (Xe Trig) under the AF Illuminator holder, and run the Xe IN 2 lead across the rear of the reflector. Tape it in position so it is lower than the highest part of the reflector.

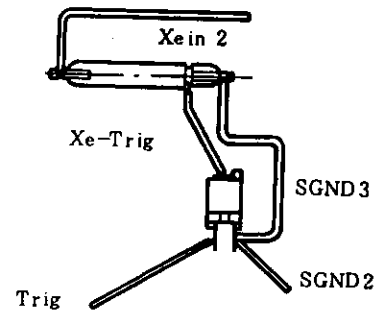


Fig. 29:

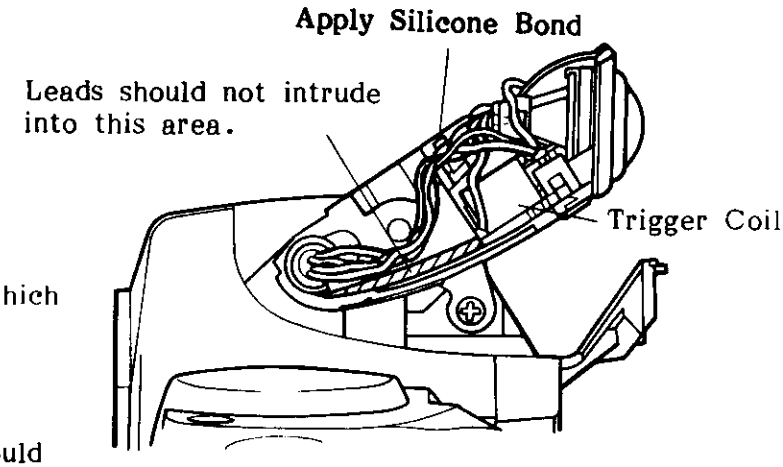


Fig. 30:

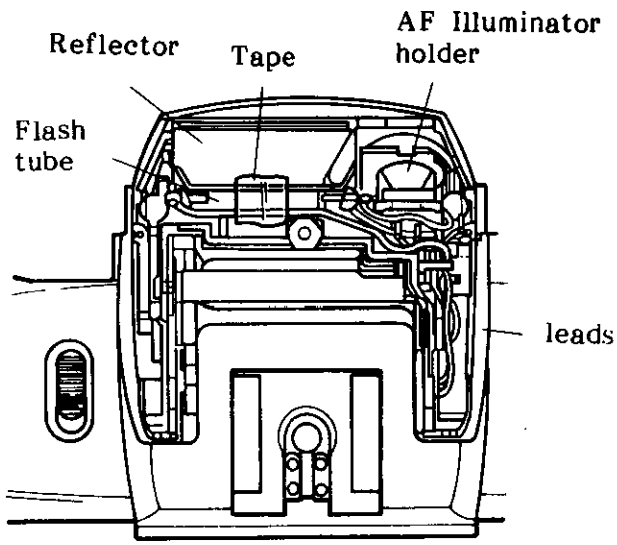
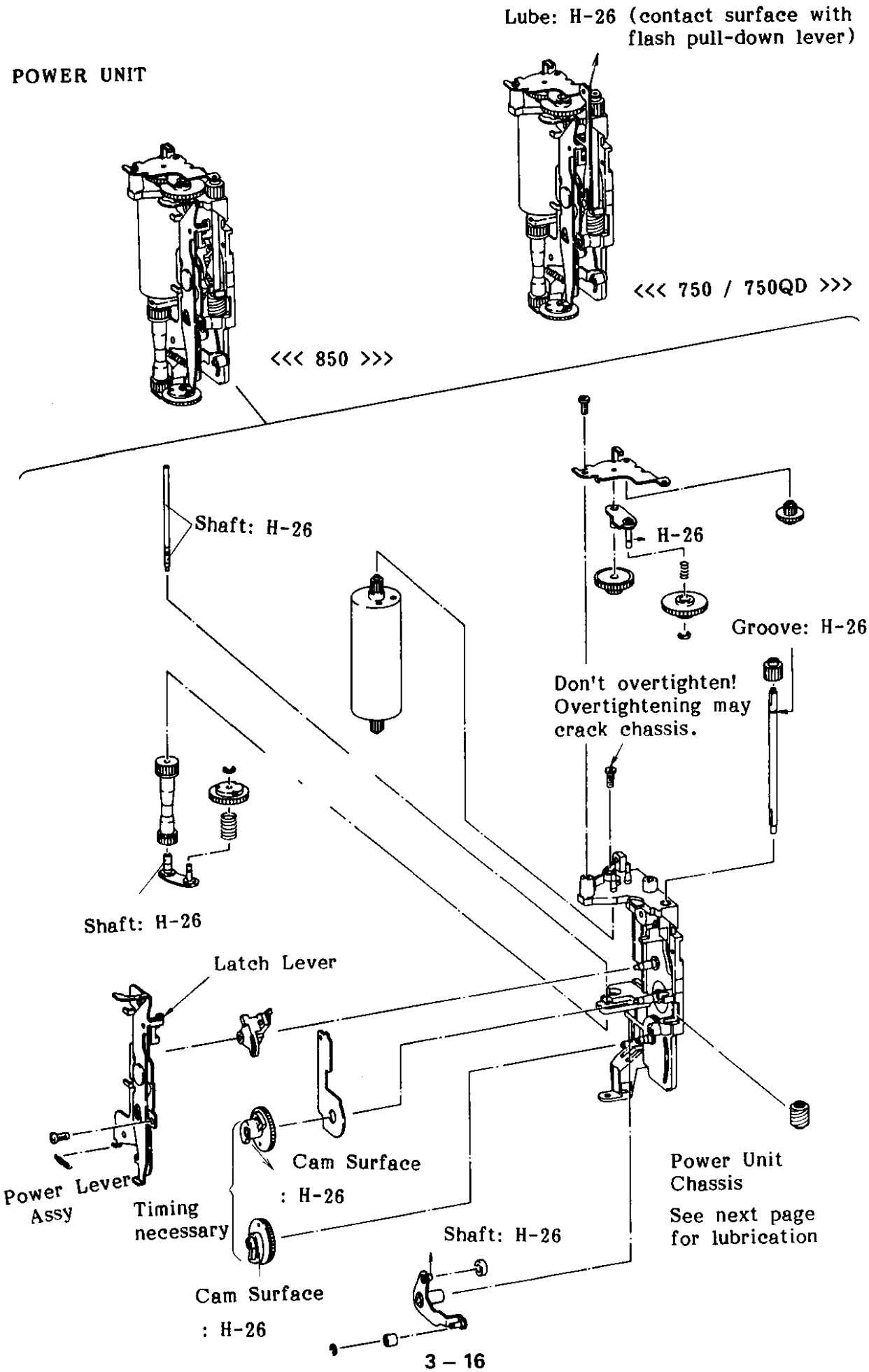


Fig. 31:

POWER UNIT


Lube: H-26 (contact surface with flash pull-down lever)
<<< 750 / 750QD >>>
<<< 850 >>>
Shaft: H-26
H-26
Groove: H-26
Don't overtighten! Overtightening may crack chassis.
Shaft: H-26
Latch Lever
Power Lever Assy
Timing necessary
Cam Surface : H-26
Cam Surface : H-26
Shaft: H-26
Power Unit Chassis
See next page for lubrication

ASSEMBLY NOTES

Mirror and Charge Cam

Mesh the cams as shown below.

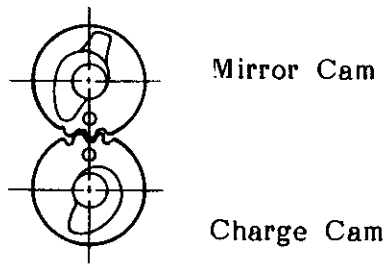


Fig. 32:

Power Uit Chassis Lubrication

Lube the gear spindles and points indicated with H-26. Paint all surfaces which contact the motor with NF-33 oil-retardant.

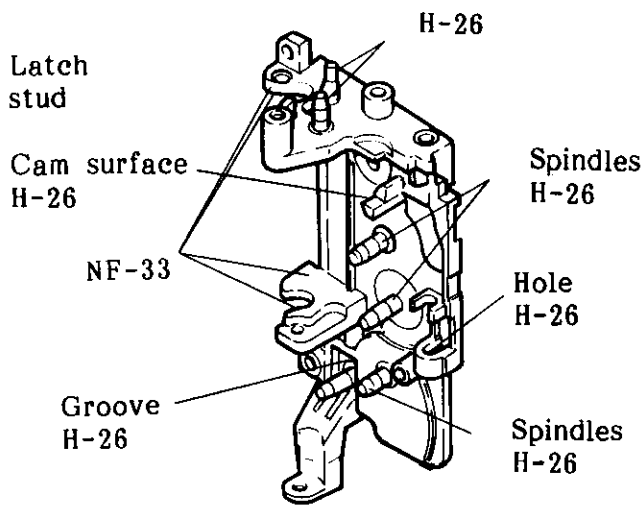


Fig. 33: Chassis Lubrication

Power Lever Assy Setting

When installing the power lever assy, push on the latch lever so it hooks on the latch stud shown in figure 33.

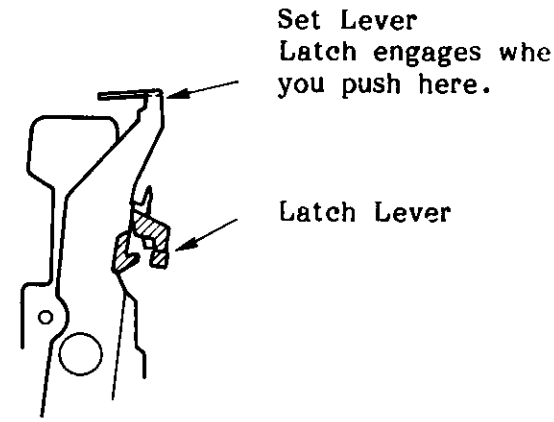


Fig. 34: Power Lever Assy

After assembly, push on the set lever and turn the motor to move the mirror up and check where the latch releases.

Lead Dress

Run the trigger lead (Xe Trig)under the AF Illuminator holder.

Run the Xe IN 2 lead across the rear of the reflector. Tape it in position so it is lower than the highest part of the reflector.

ASSEMBLY NOTES

Signal Board Unit Lubrication

Lube as shown with H-26, and lube the contact board with Electroil 190

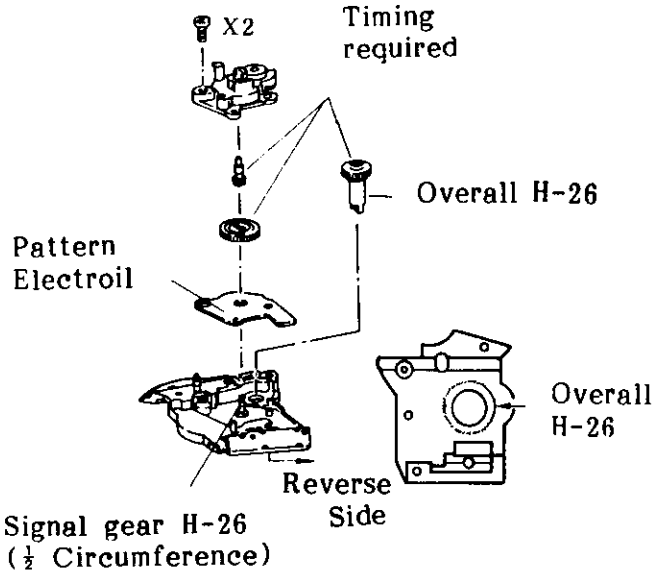


Fig. 35:

Signal Board Unit Gear Timing

Mesh the gears as shown below and install the one-tooth counter drive gear as shown also.

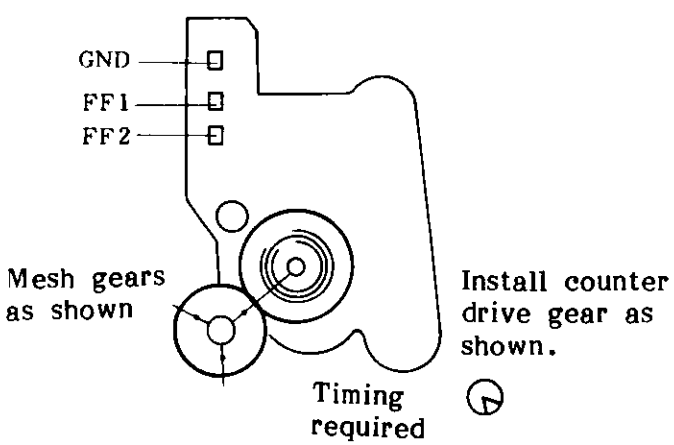


Fig. 36:

Rewind Unit

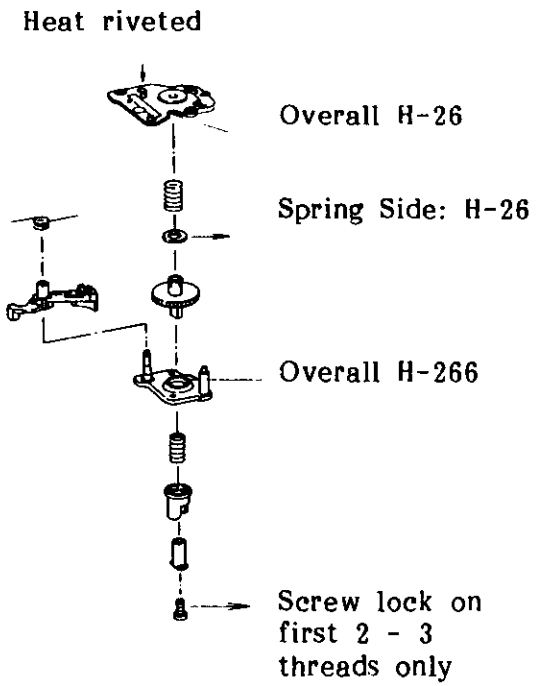


Fig. 37:

Prewind Unit

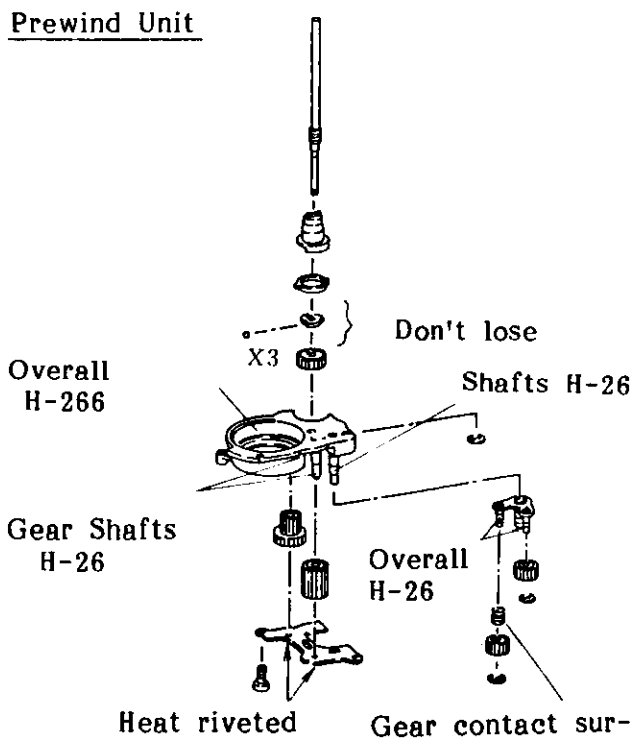


Fig. 38:

SHUTTER OVERCHARGE

(Necessary if Shutter Unit is changed).

Purpose

To insure sufficient charge stroke.

Adjustment

1. Install the shutter on the mirror box and push the seesaw lever down as far as possible. At the point, mark the maximum travel position of the pin on the second curtain drive lever (see figure). Next, release the seesaw lever and mark the position of the pin. The difference is the overcharge.

2. Apply 2 to 3 volts to the motor as shown in figure 41. Watch the operation of the pin. The overcharge should fall within the hatched area in figure 40. (This can also be done with the independent mirror box (pg. 3-9).

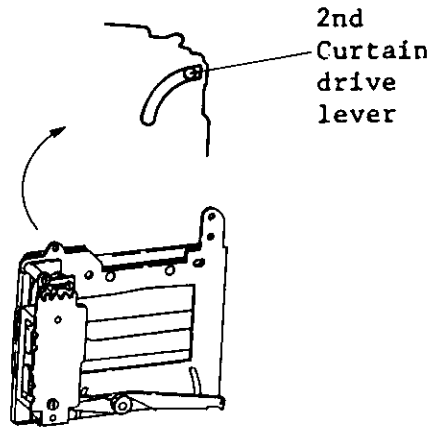


Fig. 39: Overcharge Check

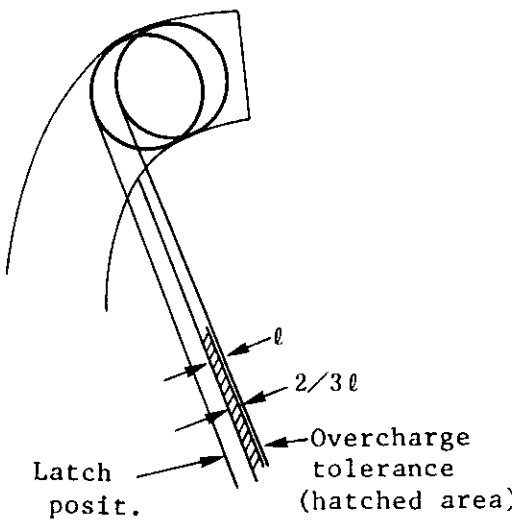


Fig. 40: Overcharge Adjustment

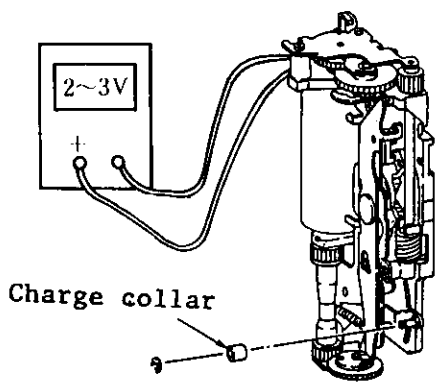


Fig. 41: Motor Connections

MIRROR ANGLE ADJUSTMENTS

(Main and sub-mirrors)
Adjustments necessary if power unit, mirror hinge plate or mirror unit is disassembled.

Purpose

To insure that the 45° angles of the mirrors are correct.

Tools

90° Collimator

EF Mount Adaptor

Tool Mirror (for 90° Collimator)

1.3mm Allen (hex key) wrench

Sub-mirror tool mirror

Standard:

Main Mirror:	Horizontal:	45° ± 8'
	Vertical :	45° ± 8'
Sub Mirror :	Horizontal:	45° ± 8'
	Vertical :	45° ± 8'

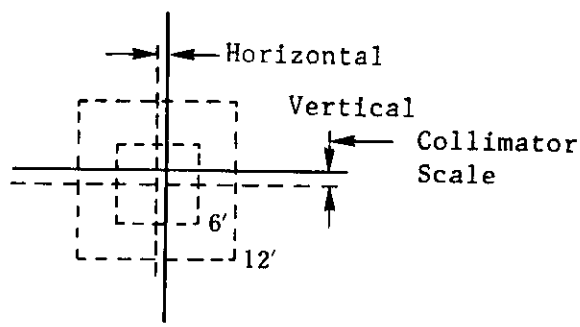


Fig. 42:

Adjustment Points

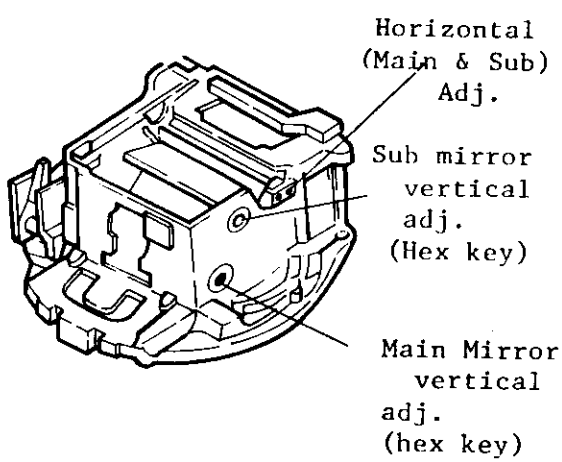


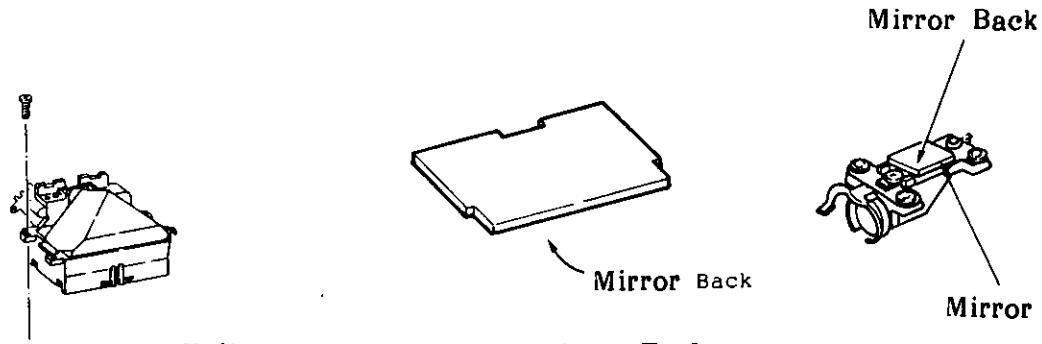
Fig. 43:

Preparation

Install the EF Mount Adaptor on the Collimator, which has an FD mount.

If the simplified 90° is used for the sub-mirror adjustment, remove and invert the lens mount.

If the universal 90° collimator is used, install the main tool mirror in place of the focusing screen and the sub-mirror tool mirror.



Pentaprism Unit Main Mirror Tool Sub-mirror Tool

Fog. 44:

Adjustments

1. Horizontal Adjustment

Move the hinge plates as shown. Repeat until both main and sub mirrors are within tolerances.

When correct, tighten the screw and stake the screw and hinge plate with screw lock.

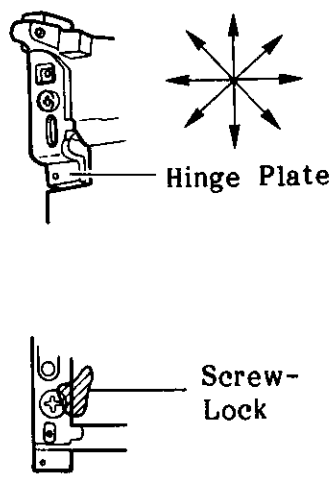


Fig. 45: Hinge Plate

2. Vertical Adjustment

Adjust the main and sub mirror using the hex sockets eccentrics on the side of the mirror box. (The adjustment order is not important.)

AF SENSOR ADJUSTMENT

Necessary if AF sensor has been removed -- Horizontal adjustment is electrical

Purpose

This adjustment aligns the center of the AF sensor with the optical axis. It is basic to the proper operation of the AF system.

Tool

EF 50mm f/1.8 lens (Normal product)

Small light source (penlight etc.)

EOS 650 or EOS 620

Standard:

The image of the sensor should be aligned with the AF mark.

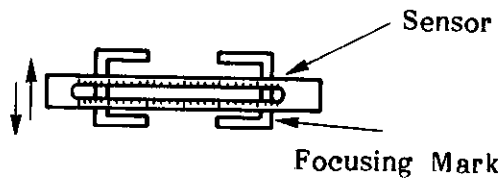


Fig. 46:

Preparation

To stop down the diaphragm, put the lens on an operational EOS 650. With the camera in the manual mode set the aperture with the electronic input dial. Push the manual aperture set button and remove the lens while holding the button in.

Adjustment:

1. Install the AF sensor unit in the front panel unit with the pentaprism and focusing screen installed.
2. Install the stopped-down EF50mm lens.
3. Shine a light through the eyepiece. Next, shine a small, powerful, spot of light through the bottom of the AF sensor unit. Now, looking into the lens the outline of the sensor should be superimposed on the focus mark as shown above. Adjust the fore and aft (vertical in the finder) position so the sensor is centered in the focus mark.

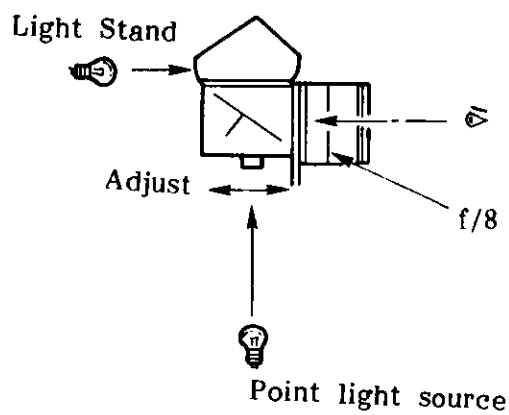


Fig. 47:

4. After adjustment, tighten the screws just enough to hold the position and stake with screw-lock. (Over-tightening may break the sensor base.)

FLANGE to FOCAL PLANE DISTANCE ADJUSTMENT

(Necessary if mount is changed, - use as few shims as possible.)

Purpose

To adjust the flange to pressure plate to the system standard, 44.14mm.

Tools

Dial Gage
2mm adaptor ring (Extends point for longer EOS FFD)
Optical flat (for Block gage)
Optical flat (for camera aperture)
Block gage (44.14mm)

Standard

44.14 $\pm$ 0.02mm	to Outer Rails (with optical flat)
44.17 $\pm$ 0.02mm	to center of pressure plate (Record reading for electronic AF adj.)

Preparation

Install the 2mm adaptor ring between the gage body and tip to compensate for the EOS systems longer FFD.

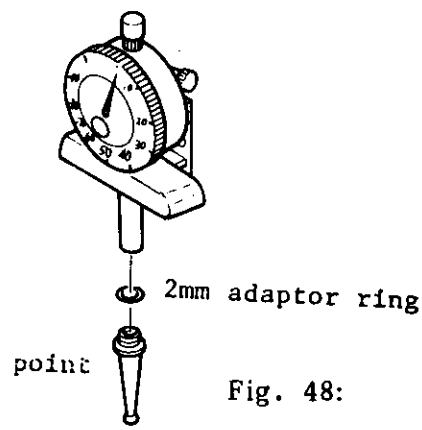


Fig. 48:

Adjustment

1. Adjust the dial gage to "0".
2. Cover the lens mount, release the shutter and remove the battery to hold the shutter open.
3. If the gage reading is plus, indicating an FFD longer than 44.14mm, install one of the undercut service lens mounts and adjust with focusing shims. See page 3-12 for details.

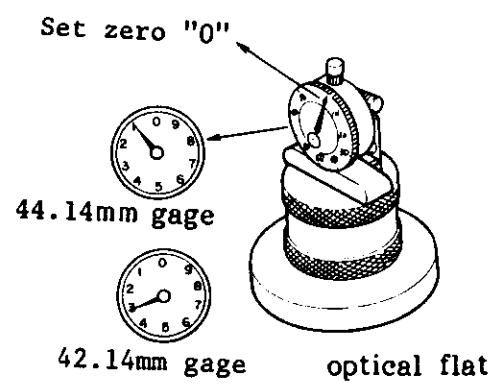


Fig. 49:

FLANGE to FOCUSING SCREEN ADJUSTMENT

(Necessary if viewfinder unit is replaced).

Purpose

To insure that the flange to focusing screen distance corresponds to the flange to film plane distance.

Tools:

90° Mirror Collimator
Correctly adjusted EF50mm f/1.8 lens
Modified EOS Focusing Screen B
Range-viewfinder Collimator 600mm
Magnifier AD-S
Allen (hex key) wrench

Standard:

44.00 ± 0.02mm
(This adjustment is not possible with the camera assembled.)

Adjustment

1. Install the modified focusing screen B and set the lens on manual and at infinity. Use the magnifier on the viewfinder.

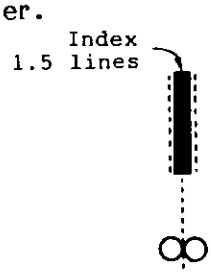


Fig. 50:
Lens infinity position

2. Adjust with washers until the collimator lines align in the viewfinder.

3. If a collimator is not available and you have good visibility, find a straight-edged target at least 250 meters away.

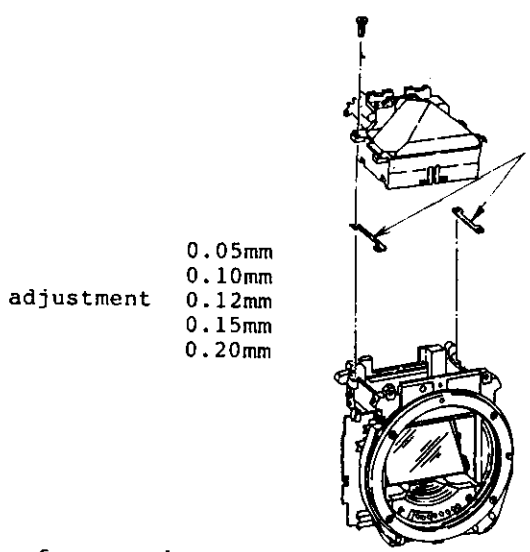


Fig. 51:
Adjustment by focus washer

OPERATING CURRENTS

Conditions

Lens; EF50mm f/1.8

Power: LVPS at 5.4V winding 0.7 ohm resistor in series. or New Sanyo 2CR5 (< 3 months)

Film: New, 36exp. Tri-X (for transport test only)

Condition	Specification	Normal Range
Stand-by[1] & LOCK	< 50uA	0uA
SW1 ON (Manual focus)	< 400mA	About 60mA
Battery Check	1350mA ± 150 mA	About 1190mA
Self timer	< 450mA	About 95mA
Prewind 3 to 4 sec. after start.	< 600mA	280 - 300mA
Winding backward After 50mS	<1,000mA	300 - 360MA <<< 850 >>> 310 - 370mA <<< 750 / 750QD >>>

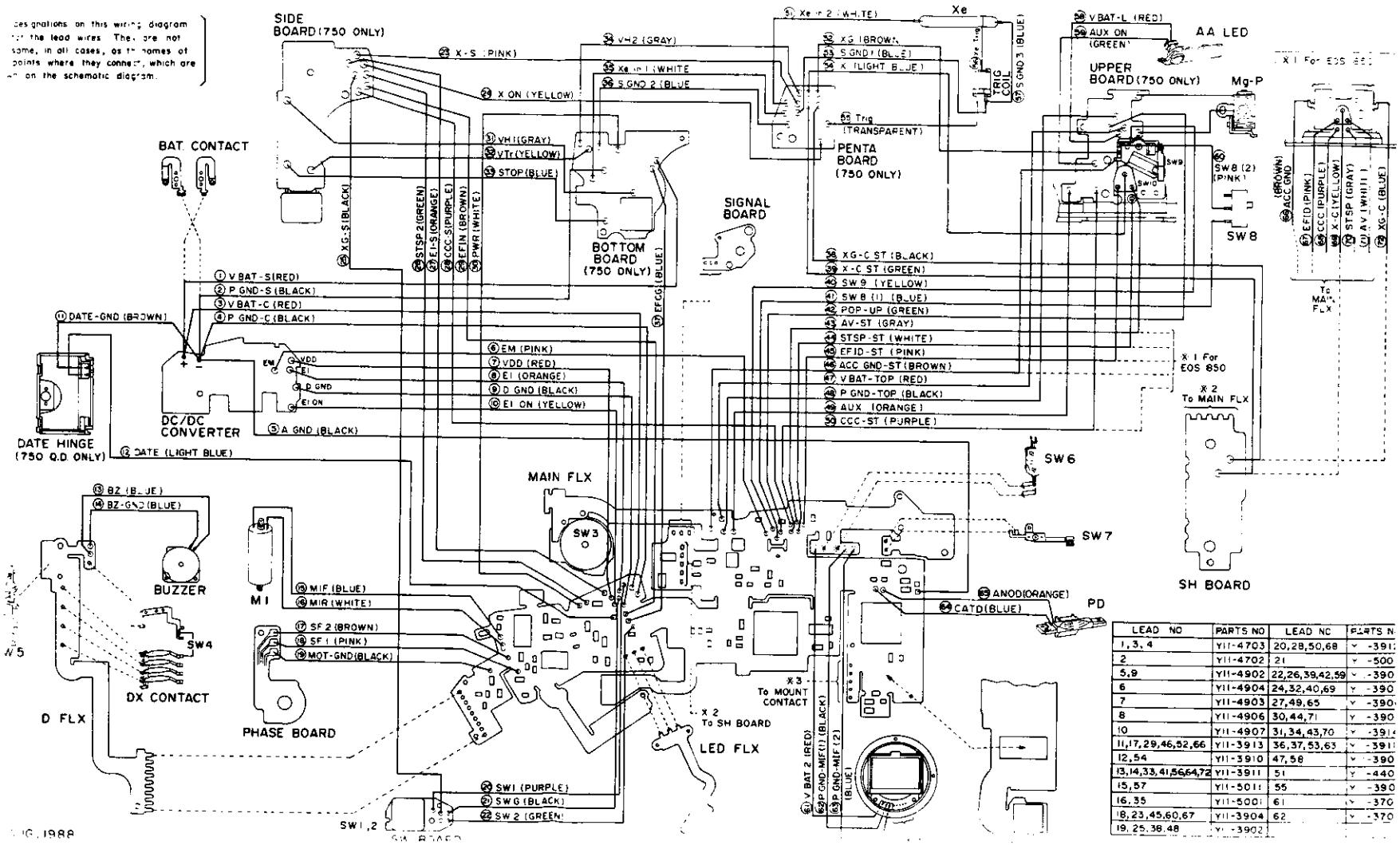
1: Stand-by Any condition other than those specifically mentioned, with no buttons pressed.

REF NO C12-804
C12-805
C12-805

CANON EOS 850
CANON EOS 750
CANON EOS 750 QD

IRING DIAGRAM

...ces gnations on this wiring diagram ...r the lead wires. The...are not same, in all cases, as th names of points where they connect, which are ...on the schematic diagram.



LEAD NO	PARTS NO	LEAD NO	PARTS N
1, 3, 4	YII-4703	20,28,50,68	Y -391
2	YII-4702	21	Y -500
5,9	YII-4902	22,26,39,42,59	Y -390
6	YII-4904	24,32,40,69	Y -390
7	YII-4903	27,49,65	Y -390
8	YII-4906	30,44,71	Y -390
10	YII-4907	31,34,43,70	Y -391
11,17,29,46,52,66	YII-3913	36,37,53,63	Y -391
12,54	YII-3910	47,58	Y -390
13,14,33,41,56,64,72	YII-3911	51	Y -440
15,57	YII-5011	55	Y -390
16,35	YII-5001	61	Y -370
18,23,45,60,67	YII-3904	62	Y -370
19,25,38,48	YI -3902		

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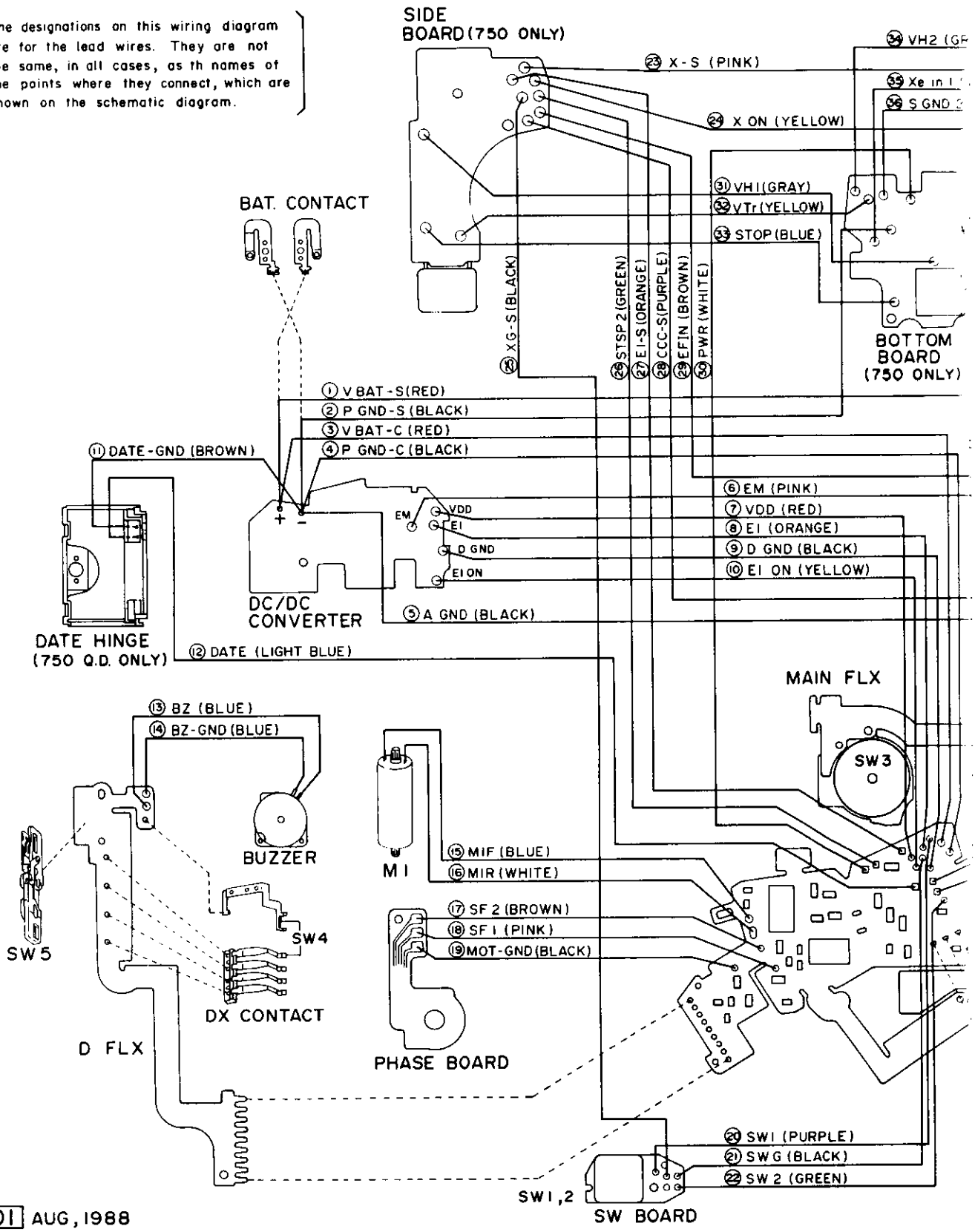
WIRING DIAGRAM

The designations on this wiring diagram are for the lead wires. They are not the same, in all cases, as th names of the points where they connect, which are shown on the schematic diagram.



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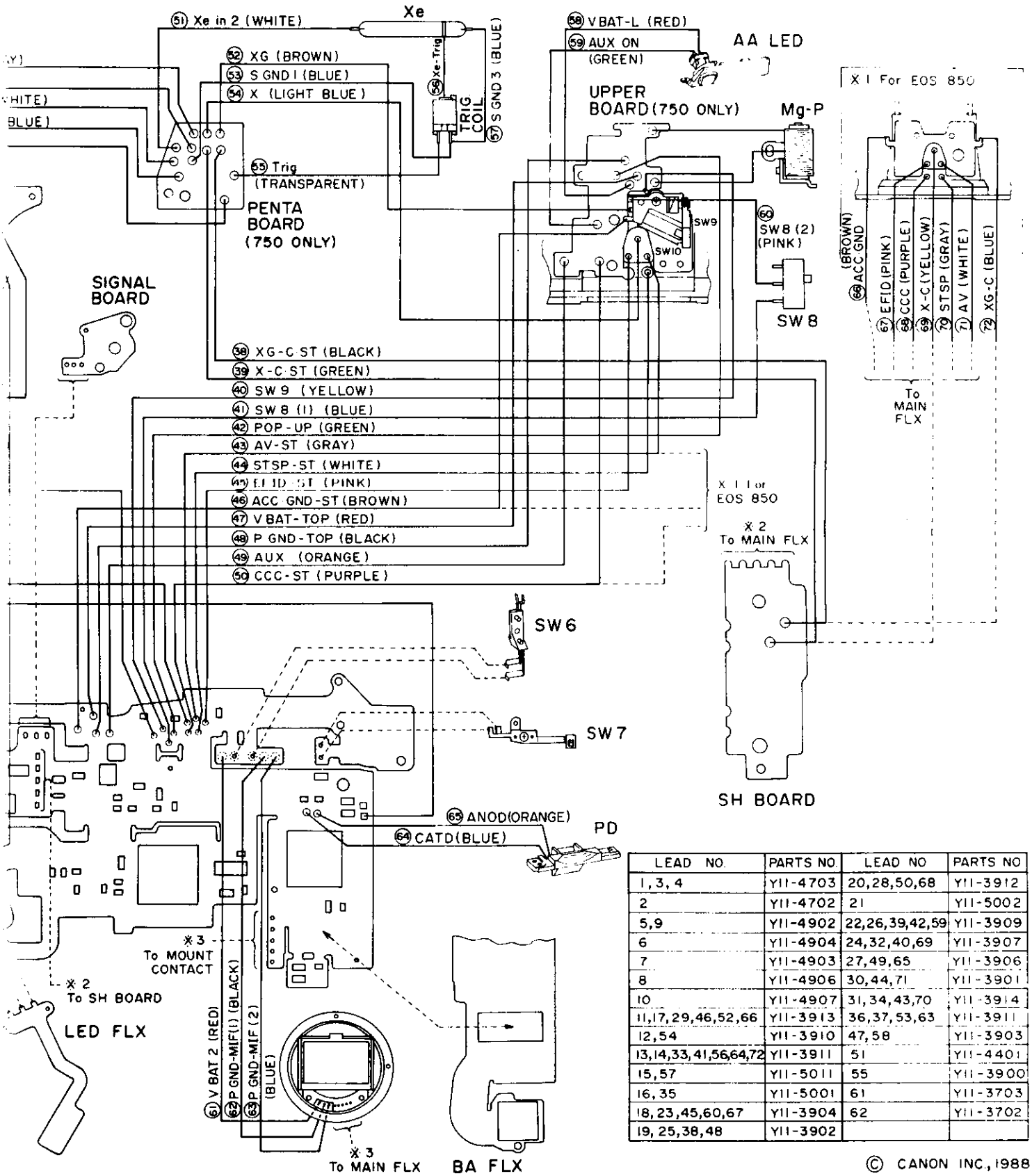
REF. NO. C12-8042
C12-8052
C12-8053

EOS 850
EOS 750
EOS 750 Q.D.



LEAD NO.	PARTS NO.	LEAD NO	PARTS NO
1, 3, 4	YII-4703	20,28,50,68	YII-3912
2	YII-4702	21	YII-5002
5,9	YII-4902	22,26,39,42,59	YII-3909
6	YII-4904	24,32,40,69	YII-3907
7	YII-4903	27,49,65	YII-3906
8	YII-4906	30,44,71	YII-3901
10	YII-4907	31,34,43,70	YII-3914
11,17,29,46,52,66	YII-3913	36,37,53,63	YII-3911
12,54	YII-3910	47,58	YII-3903
13,14,33,41,56,64,72	YII-3911	51	YII-4401
15,57	YII-5011	55	YII-3900
16,35	YII-5001	61	YII-3703
18,23,45,60,67	YII-3904	62	YII-3702
19, 25,38,48	YII-3902		

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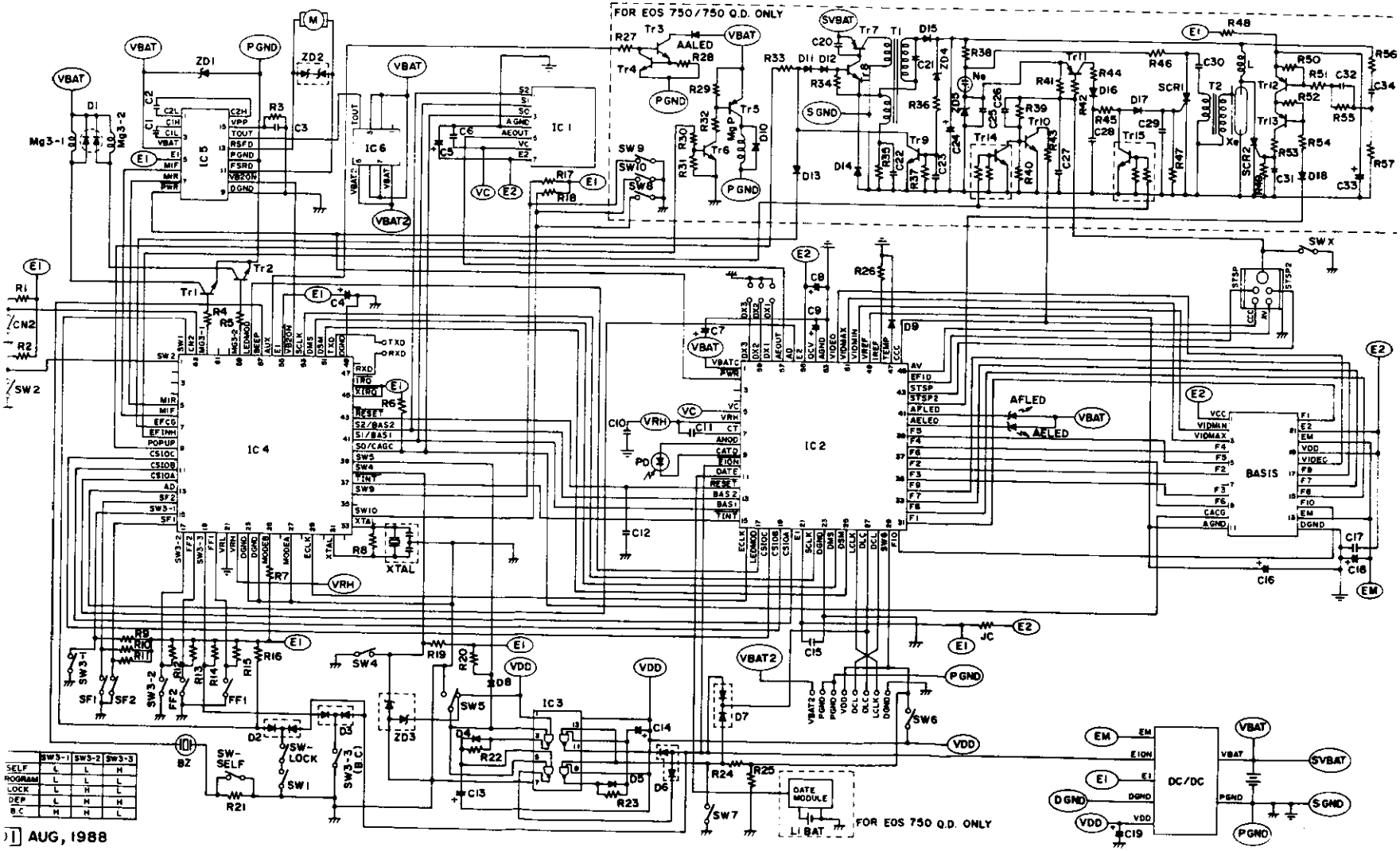
CANON EOS 850
EOS 750
EOS 750 Q.D.

REF. NO. C12-8042
C12-8052
C12-8053

CHEMATIC DIAGRAM



	SW3-1	SW3-2	SW3-3
SELF	L	L	H
PROGRAM	L	L	L
LOCK	L	H	L
DEP	L	H	H
B.C	H	H	L

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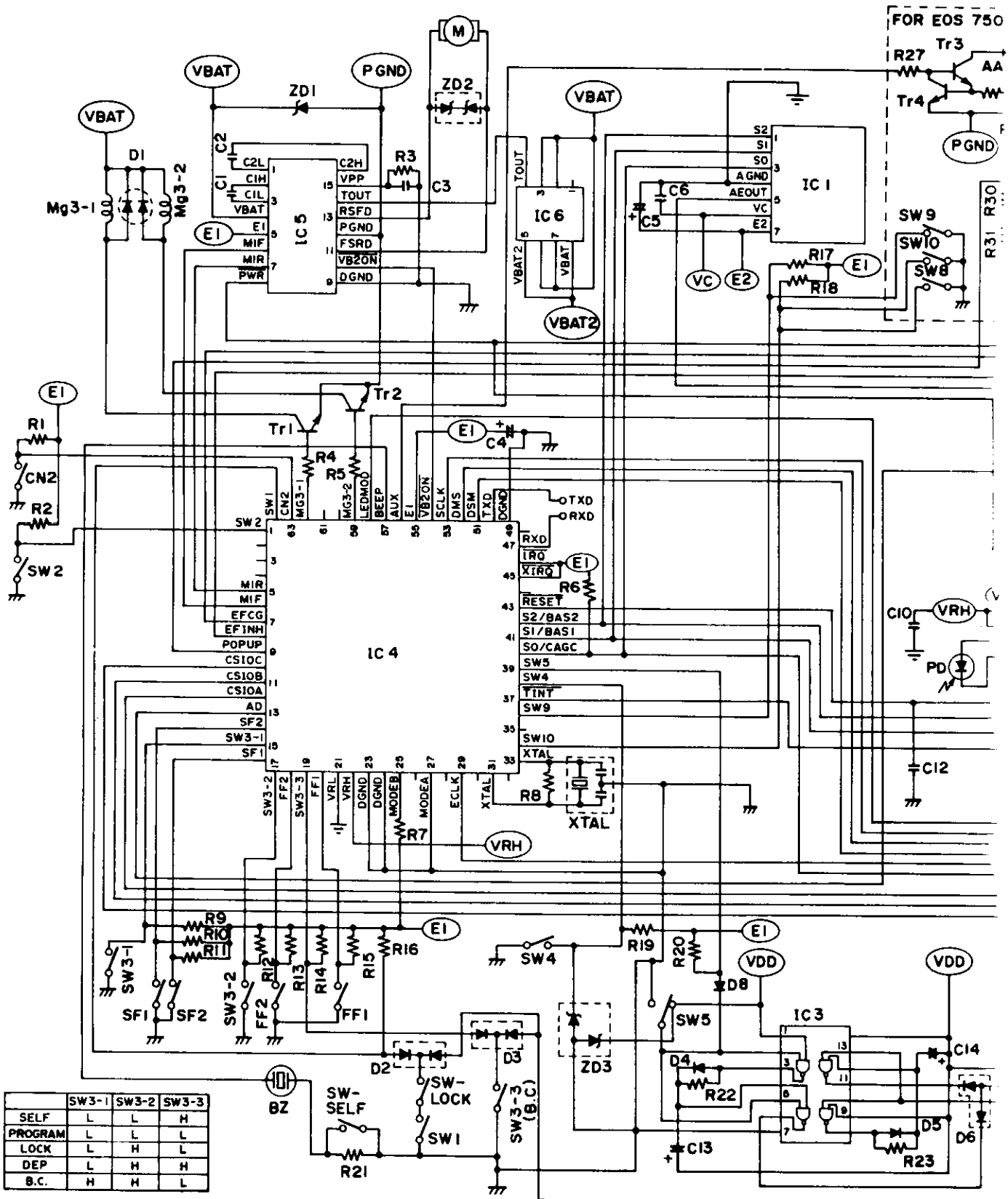
SCHEMATIC DIAGRAM

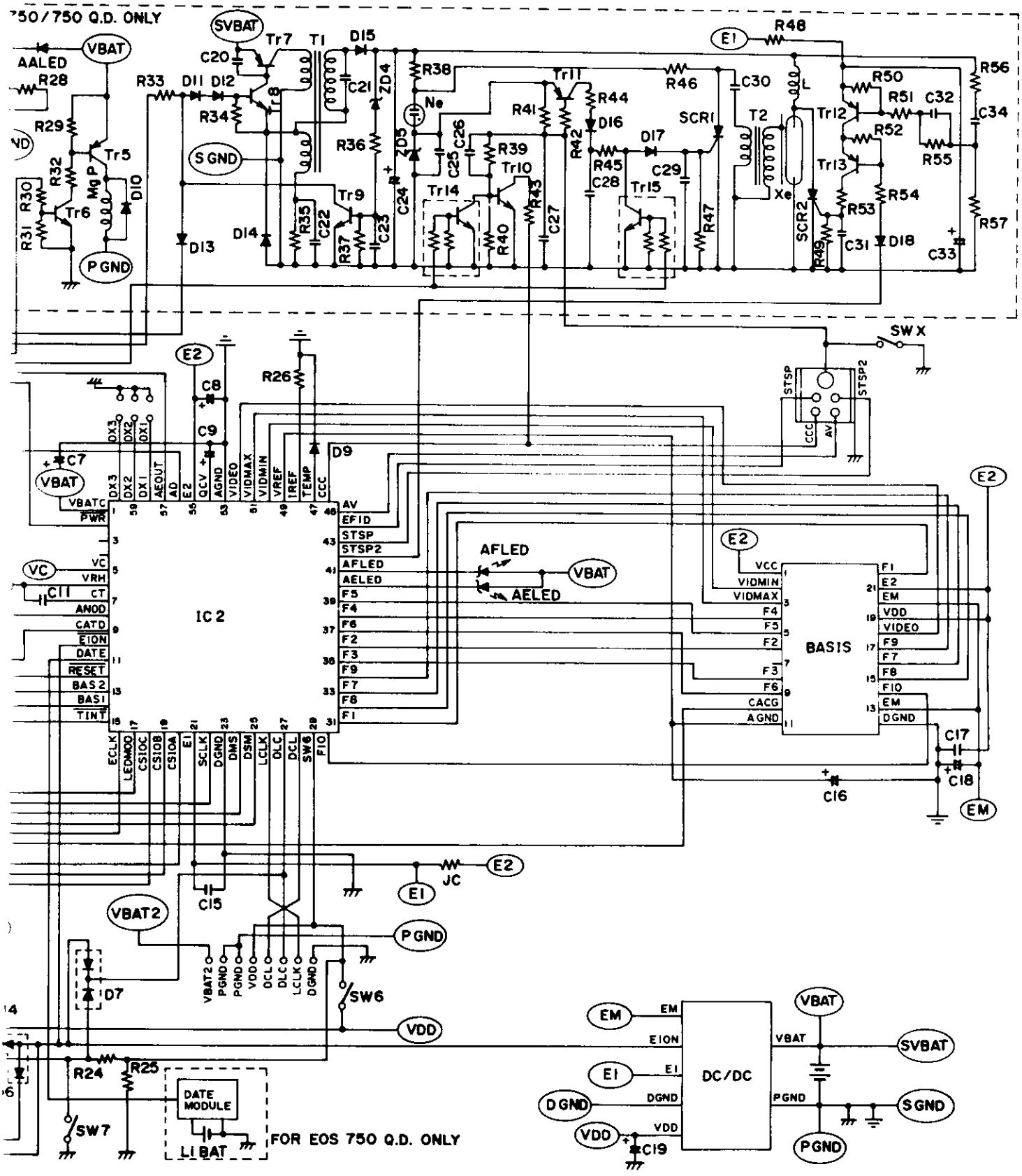


	SW3-1	SW3-2	SW3-3
SELF	L	L	H
PROGRAM	L	L	L
LOCK	L	H	L
DEP	L	H	H
B.C.	H	H	L

01 AUG, 1988

EOS 850
EOS 750
EOS 750 Q.D.

REF. NO. C12-8042
C12-8052
C12-8053



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